OCTOBER, 1956

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PIPE LINE INDUSTRY

Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

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SERIAL RECORD
OCT 23 1956
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PIPELINING BEHIND THE IRON CURTAIN

page 58

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A Report on Positive Displacement Meters

page 32

Care of Construction Machinery Pays Off

page 48

Heat exchangers at Grozny pump station. Oil is supplied to Grozny refineries from the oil fields along the trunk line. (See map, page 58)

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Turn the page for additional contents and Quick Review of this issu

SCRUBOSPHERE* ...

... FOR *Cleaner Gas* AT *Less Cost!*

***PEERLESS SPHERICAL DUST and LIQUID SCRUBBER FOR GAS PIPELINES**

(A) The majority of incoming liquid and solid particles are directed down into reservoir. 1

(B) Lighter solid particles carried by gas stream are separated on surfaces of contactor which are kept wet and clean by revolving thru liquid reservoir. 2

(C) Contactor is revolved by explosion-proof gear motor.

(D) Mist Extractor removes any remaining liquid particles from gas stream prior to outlet. 3

- The **dust removal ability** of the SCRUBOSPHERE **is superior** because it utilizes wetted surfaces for dust collection which are much more closely spaced than in conventional equipment.
- **Oil loss is minimized** because the oil used to wet the dust collecting surface is lifted mechanically instead of bubbling gas through the oil which results in foaming and loss due to creation of hard-to-separate fine particles.
- **Maximum performance and low cost** — The spherical design means high capacity and performance because it provides maximum dimensions for the contactor and mist extractor which normally are limiting factors in scrubber designs. The vessel cost is reduced because required vessel thickness is only one half that required for cylindrical vessel of same diameter.
- **Versatility** — separates solid and liquid particles with equal efficiency.
- **Low pressure drop** — ½ to ¾ psi at rated capacity depending on nozzle size.

PEERLESS MFG. CO. DALLAS TEXAS

PEERLESS MANUFACTURING CO.

P. O. BOX 13165 DALLAS, TEXAS

Representatives in All Principal Cities

Write for test data showing dust removal and oil loss of Peerless Scrubosphere as against conventional dust scrubber.

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PIPE LINE INDUSTRY

October, 1956 Vol. 5, No. 4

CONTENTS and Quick Review

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Pipe Line Panorama

☐ What role will U. S. pipeliners play in moving crude to Europe if the Suez Canal is shut down? What major pipe line company is revamping its entire pipe line system? How serious is the line pipe shortage? You will find answers to these questions, plus many other subjects of vital interest to pipeliners in the new PIPE LINE INDUSTRY feature *Pipe Line Panorama*. Keep abreast of the big news in the pipe line industry in three minutes' reading time. Turn to **Page 27.**

"Sea Train" Methods Used to Cross Corpus Christi Bay in Five Days

☐ Laying 60,000 feet of pipe in waves four feet high gave a good test of this new idea in submarine pipelining. Fifteen 4000-foot sections were towed into the bay to be joined together by over-water welding.
Melvin A. Judah ..... **Page 28**

140 Million Barrels of Crude by PD Meters

☐ More than 140 million barrels of crude oil have been metered at Interstate Oil Pipe Line Company's terminals using positive displacement meters. The result has been a highly satisfactory maintenance and operating record.
D. C. McKinley ..... **Page 32**

How You Can Make Your Operating Standards Pay

☐ By installing operating standards for design and drafting, one company saved $91,000 in one year! The responsibility for such savings rests with the engineer. Here is a timely, information-packed report on the methods the engineer can use to maintain effective operating standards.
A. A. Hardy ..... **Page 37**

Sifting Backfill for Profit

☐ New pipe line padding machinery cuts costs of providing adequate protection to pipe line coating in rocky terrain. Cost estimates vary from 10 cents to 20 cents per foot compared to costs as high as 60 cents to 70 cents per foot for older methods.
Richard J. Titus ..... **Page 39**

Service's Sooner Microwave

☐ Service Pipe Line Company's new microwave system in Oklahoma gives more direct and more reliable communication by eliminating 121 miles of landline and making possible remote control from a station in Texas.
Bill Brock ..... **Page 42**

Are You a Retirement Addict?

☐ Today's trend to glorify retirement and hobbies has created a new philosophy—a philosophy that may not be good. For a humorous, thought-provoking discussion of the fad that has made it unfashionable for a man to like his work—particularly after retirement, don't miss this article. **Dr. Allan James Fleming and Dr. C. A. D'Alonzo** ..... **Page 45**

Care of Construction Machinery Pays Dividends

☐ Here is a collection of ideas for getting top performance from equipment under tough operating conditions. These ideas are the result of suggestions of engineers with a leading manufacturer. Check to see how many of them you can put to profitable use during late fall and early winter work.
J. J. Keyes ..... **Page 48**

Pipelining Behind the Iron Curtain

☐ Russia's Sixth Five-Year Plan calls for nearly 20,000 miles of oil and gas pipe lines to help meet problem of moving crude, products, and gas over vast distances between fields and consumption centers. This comprehensive report includes the latest pipe line statistics from the current Five-Year Plan, plus a complete analysis of Communist construction projects. . . . . **Page 58**

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PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

U. S. Tax Burden Can Be Cut

Too large a share of the money earned by Americans has become a fleeting thing that flows swiftly through our fingers on its way to the tax coffers of the federal government and 48 state governments.

Few Americans realize how much of their income goes to pay government taxes. This is because there are so many hidden taxes.

If you don't believe it, look at this one example: With the new hike in gasoline taxes, the average U. S. car owner will pay an annual state and federal gasoline tax of nearly $70. More of these startling statistics reveal that the 48 states have collected over $26 billion in gasoline taxes during the last 25 years, and that state and federal gasoline taxes have nearly tripled in the last 10 years, rising from $1½ billion to more than $4 billion annually.

This is but one tax example. There are taxes on alcohol, cigarettes, automobiles, tires and thousands and thousands of other items. These are hidden taxes, paid in purchase prices. Finally, individuals pay income taxes and corporations pay taxes on profits. In all, taxes take over 30 percent of the total national income.

•

Every American must now work one day out of every four to support federal and state governments. In 1929, one day's work out of ten went for government support.

In spite of tremendous technological advances bringing amazing gains in productivity, the average American today must work two times as many hours to pay his taxes as he did 27 years ago. If this rate of increase is permitted to continue, each American will have to work 1000 hours every year just to pay his taxes in 1983.

Obviously, long before this occurs our economy will collapse. The individual citizen could not possibly work enough hours to support both the government and his family.

There is another extremely important consideration. The phenomenal productivity of the U. S. is based upon large-scale investment capital. There must be sufficient investment capital available for new enterprises and for expansion of old concerns to keep the American business system alive. This is the way jobs are made. Huge productivity is made possible by providing an average of $12,000 worth of equipment per person, and spending more than $400 a year per worker for maintenance of this equipment.

It is impossible to get sufficient investment capital with a tax system that takes most of the surplus above actual living costs. By leaving too little for investment, such a tax program undermines the very foundation of the American economic system that has given the U. S. abundance in peace and might in war—and on which the future of the nation depends.

•

Fortunately, something can be done immediately about federal government expenditures, which amounted to $66 billion last year.

The solution: Adoption of the Hoover Commission proposals for eliminating waste and inefficiency. This could cut federal government costs by $5½ billion or more annually. Since federal income taxes alone take over $30 billion from our earnings annually, this saving could result in a 15 percent federal tax decrease for the 66 million U. S. workers.

This is not only worth thinking about—it is worth doing something about.

Now is a very opportune time to take action. It is a national election year. Write all candidates for the Senate and House of Representatives that you want wasteful federal government spending stopped, and ask them to pledge action.

Time is important. Every minute's delay in putting the Hoover proposals in effect means the waste of $10,500 per minute. Every hour costs $630,000, and every day costs $15,120,000.

Warren L. Baker

IT'S LIGHTER BUT TOUGH!

41% LIGHTER!

Quick, easy operating

Slips over pipe

No hinges or latches

Clean, accurate cuts

Reduces fatigue

THE NEW Mathey TWIN!

PIPE CUTTING AND BEVELING MACHINE

Made of aluminum, treated with special hardening process. Approximately 41% lighter providing fatigue free durable performance. Designated as Series L, it's available in #3-L, #4-L and #5-L. The regular rugged Standard available in #1, #2, #3, #4 and #5. There is no Pipe Cutting and Beveling Machine lighter than a Mathey Twin. There is no machine more rugged than its brother, the regular Standard Model. You can't beat a Mathey Pipe Cutting and Beveling Machine for accuracy, speed and economy.

Also featuring these other field tested Mathey Products:

SHAPE CUTTER
COUPON CUTTER
OUT-OF-ROUND ATTACHMENT
FLANGE LINE-UP PINS
MAGNETIC CIRCLE CUTTER
MAGNETIC STRAIGHT EDGE

for SPEED, ACCURACY, DEPENDABILITY, SERVICE AND ECONOMY—IT'S MATHEY

SEE OUR CATALOG IN THE COMPOSITE CATALOG

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ONE OF THE GARLOCK 2,000

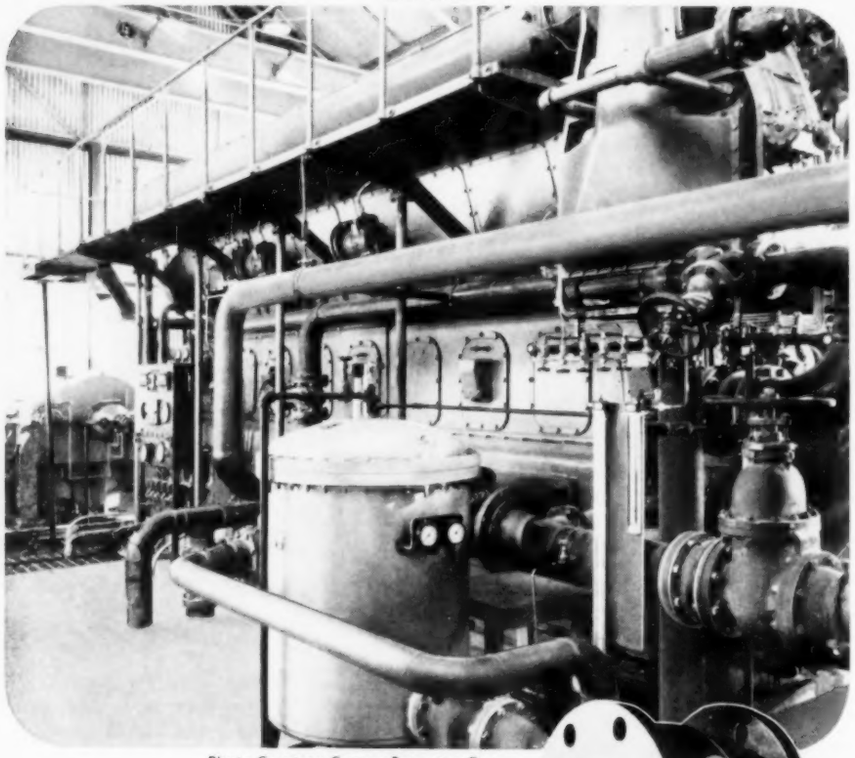
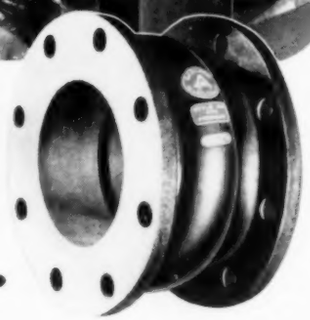


Photo Courtesy Cooper Bessemer Corp.

First Unattended Compressor Station Installs...



DEPENDABLE GARLOCK EXPANSION JOINTS Gulf Interstate Gas Company's Stanton, Kentucky station automatically pumps 400,000,000 cu. ft. of gas per day into northern markets. It's the first fully-automatic engine driven centrifugal compressor station...it's remote-controlled from Clementsville, Ky., 80 miles away. Obviously, the equipment supplied for such a project had to be the most reliable. Garlock neoprene-lined Expansion Joints were used on both oil and water lines to dampen vibration.

Rubber Expansion Joints are an important part of "the Garlock 2,000"...two thousand different styles of dependable gaskets, packings, and seals. It's the only complete line. It's one reason you get *unbiased* recommendations from your Garlock representative. Call him or write for Expansion Joint Bulletin AD-137.

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For Prompt Service, *contact one of our 30 sales offices and warehouses throughout the U. S. and Canada.*

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WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.

PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

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New CAT* No. 9 Ripper FOR THE Mighty D9!

First choice for push-loading, the D9 is now more versatile than ever. The new No. 9 Ripper lets the D9 rip tough or frozen material between loading cycles. Faster, easier scraper-loading cuts time and costs.

TRACTOR-MOUNTED

The tractor-mounted No. 9 Ripper utilizes the weight of the D9 to force the teeth into hard material. No need for ballast or extra weights. The hydraulically operated ripper affords maximum maneuverability because it is tractor-mounted.

"LIVE DRIVE" HYDRAULIC PUMP

New No. 50 Hydraulic Control has a constant power pump that supplies the capacity to raise or lower ripper teeth *independently* of flywheel clutch or torque converter.

TWO RIPPING POSITIONS

Shanks may be pinned in either of two ripper positions which provide either maximum ground clearance when raised or maximum penetration (up to 28") when lowered.

TRIPLE TEETH

Use one, two or three. Any or all of them can be swung up and pinned out of the way. Teeth pivot 10° to either side. This permits tractor steering and smoother ripping through rocks. Shanks are heat-treated alloy steel, with hardened alloy cast steel boots. Points are hardened cast steel, *pin-attached* for easy replacement.

MANY OTHER IMPORTANT FEATURES!

Now the new No. 9 Ripper makes the "King of the Crawlers" an even more profitable and versatile machine. Mail the coupon for full details, or call your nearby Caterpillar Dealer. And remember, you can count on him for reliable service, and for parts you can trust.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR*

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MODERN HEAVY-DUTY TRACTOR RIPPERS

MAIL TODAY!

Caterpillar Tractor Co., Dept. D-106, Peoria, Illinois
I would like more information on the new No. 9 Ripper

*Name*_____

*Company*_____

*Address*_____

*City*_____ *Zone*_____ *State*_____

PROVED PROTECTION

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KONTOL 77®

Kontol 77 Corrosion Inhibitor protects pipe lines against corrosion and scaling. In addition, its detergent characteristics prevent fouling and help to maintain a high "C" factor.

Kontol 77 is applicable for the protection of all petroleum pipe lines, from crude oil service to finished products lines. It meets military specifications as an approved rust and corrosion inhibitor for use in jet fuels and automotive gasoline.

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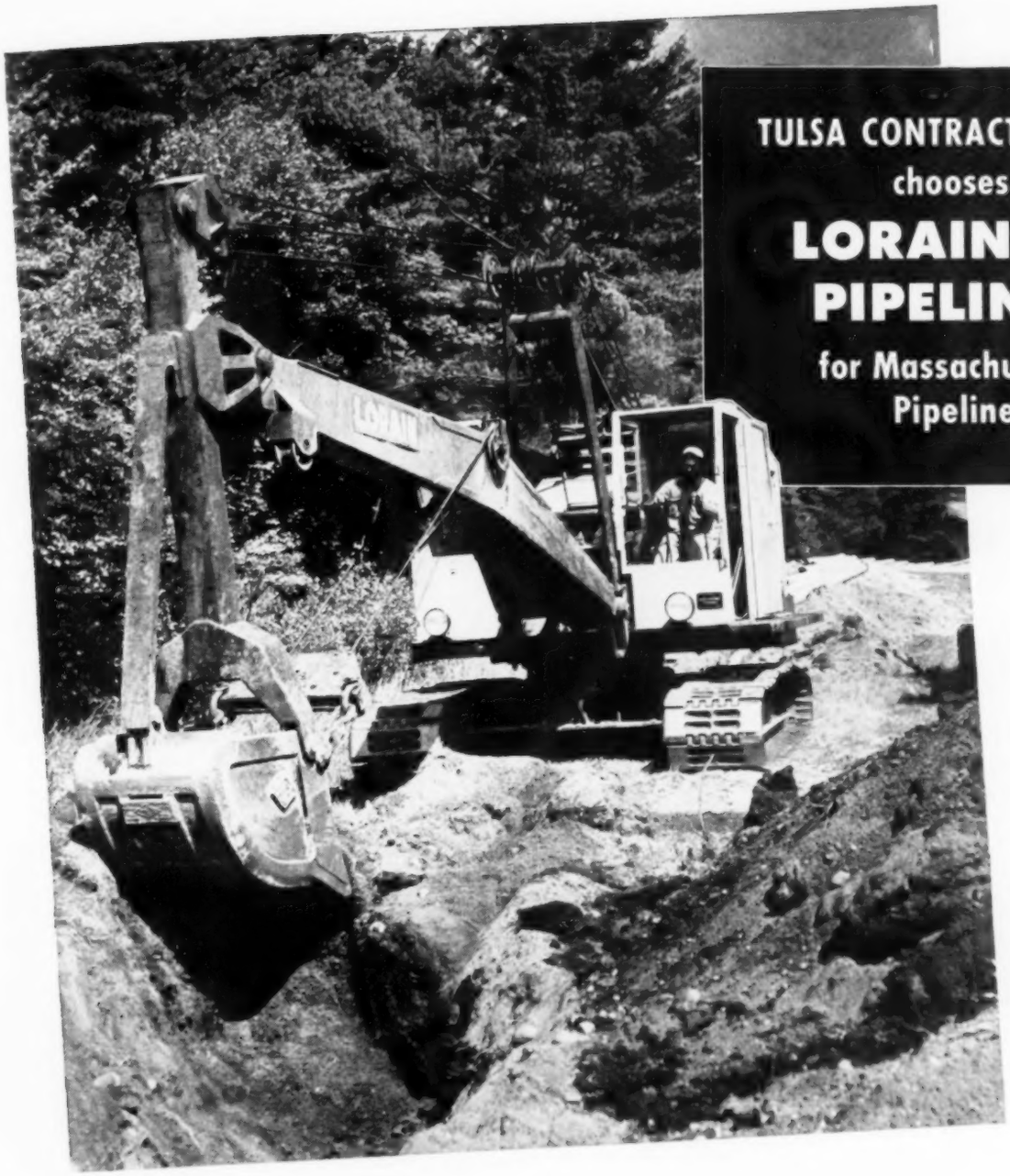


TULSA CONTRACTING CO. chooses LORAIN-26 PIPELINER for Massachusetts Pipeline

At its best, cross-country pipelining in New England is rough and rocky. For that kind of tough digging, Tulsa Contracting Co., East Providence, Rhode Island, put a Lorain-26 Pipeliner with 40" wide hoe dipper on a 12-mile natural gas pipeline job from Concord to Ayer, Mass. A 4-ft. deep, 3-ft. wide trench was dug through a good crop of boulders mixed with earth.

Lorain-26 Pipeliners have what it takes to "blast through the tough ones" . . . because the "26" Pipeliner is designed for that kind of duty. Lorain "E-Z" Controls, mounted throughout on anti-friction bearings, reduce operator effort and fatigue. Hydraulic Power Crawler Controls make it easy and fast to maneuver Pipeliner along the job. Independent travel, available as an extra, permits moving up on the job at will without interfering with other operations. Longer, 19-ft., stronger gooseneck boom gives maximum digging ranges . . . digs hardest materials. Larger, self-adjusting, 18" clutches make operation smoother, adjustments fewer and machine life longer. Sealed, anti-friction, bearing-mounted idler rollers reduce wear from mud and dirt. Bushed treads are available.

Get all the facts on the Lorain-26 Pipeliner. It has the features pipeline men want and need. Your Thew-Lorain Distributor has complete facts and figures for you!

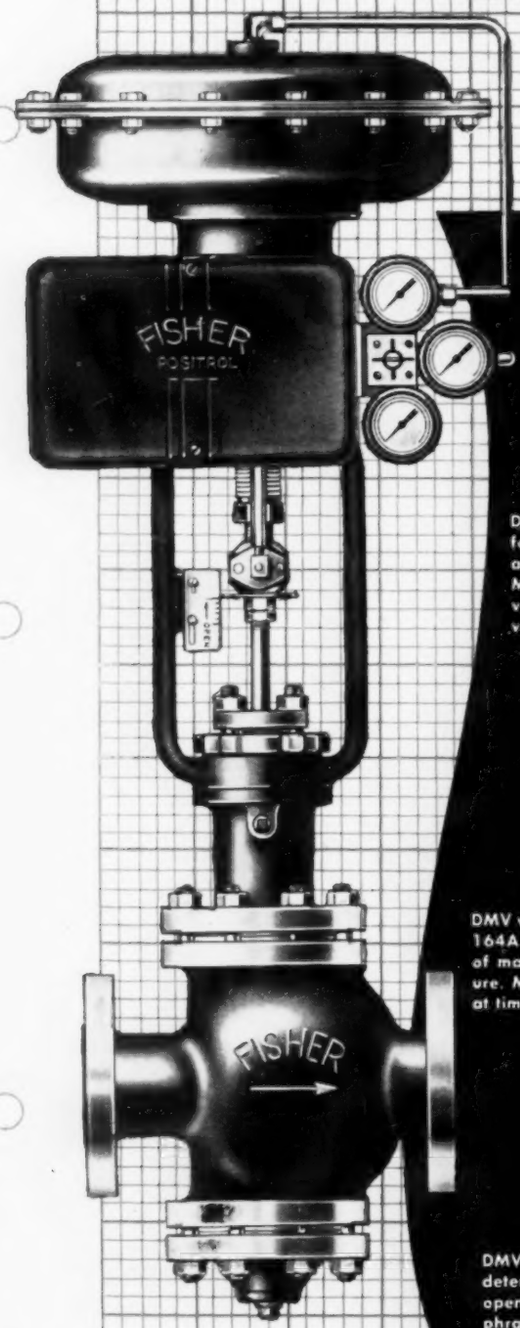
THEW LORAIN®

THE THEW SHOVEL CO., LORAIN, OHIO

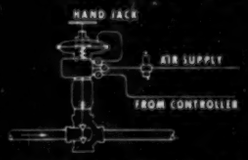
FISHER®

THE ANSWER TO YOUR *Control Problem*

Built for your specific requirements, Fisher Diaphragm Motor Valves are manufactured to handle pressure conditions up to 30,000 pounds, for high pressure drops and are available in metals for highly corrosive service and alloys for high temperature work.

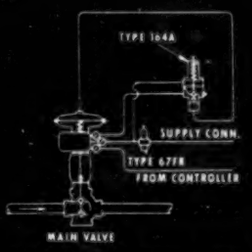


TYPICAL EXAMPLES OF FISHER DIAPHRAGM MOTOR VALVE WIDE RANGE ADAPTABILITY

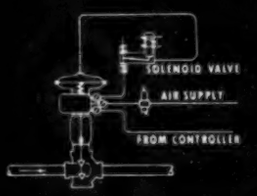


DMV with Hand Jack Operator. Allows for manual operation against spring action. Limits travel of valve. Example—Maximum opening in spring opened valve. Minimum closing in spring closed valve.

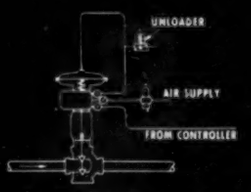
DMV with Continuously Connected Handwheel. Operator can open or close valve against controller action. Can operate valve manually if operating medium fails. Can set maximum opening or minimum closing of inner valve.



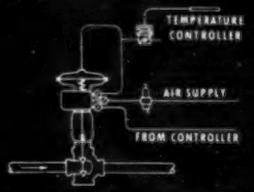
DMV with Air Lock-up system using Type 164A to close air circuit to diaphragm of main valve in case of plant air failure. Main valve will be held in position at time of supply pressure failure.



DMV with Remotely Actuated Electric Solenoid Trip Out. Valve may be fully opened or closed by unloading operating pressure from diaphragm by solenoid operation. Solenoid is actuated from manual switch or an electric tie-in circuit.



DMV with Air Cut-out Feature. At predetermined pressure setting, unloader opens and bleeds pressure off diaphragm to keep main valve open. Unloader orifice is larger than controller orifice so main valve remains open. Operation restored by putting thumb over open end of unloader.



DMV with Auxiliary Controller Override. An auxiliary controller, such as temperature, placed in operating air line to diaphragm—can over-ride action of main control function by unloading diaphragm and taking over functional operation of DMV.

FISHER GOVERNOR COMPANY

MARSHALLTOWN, IOWA • WOODSTOCK, ONTARIO

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

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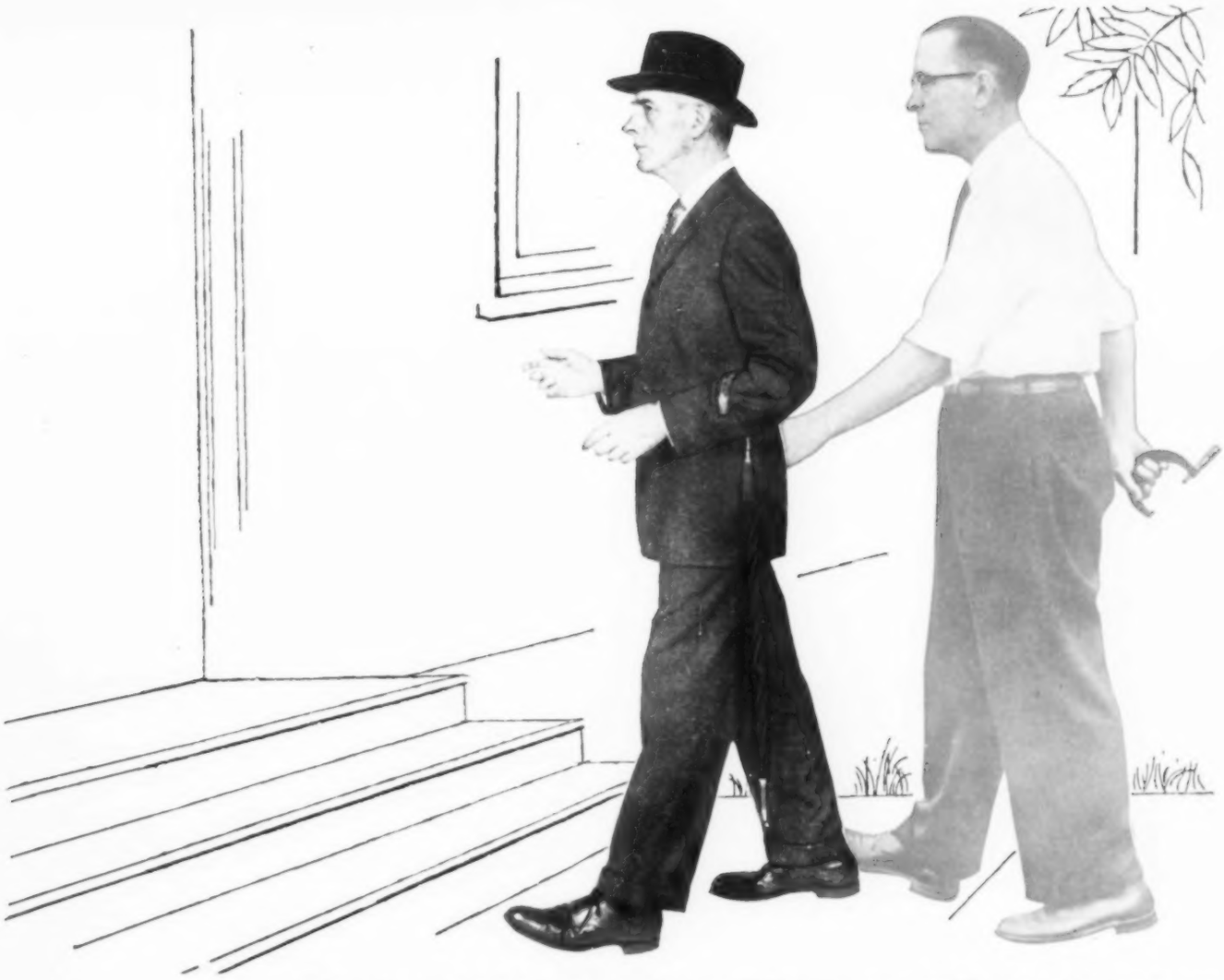


Your Wickwire Rope Distributor and our die maker... ready to serve you

This die maker—one of the skilled technicians responsible for the quality of our rope wire—is with your Wickwire Distributor every time he makes a call.

True, he's physically in our plant, working to tolerances of 1/10,000 of an inch as he fashions the super-hard carbide dies used to produce every foot of rope wire. But, whenever your Wickwire Distributor makes his call, he has the full assurance that *every* wire in the product is exactly the size it should be and has a smooth, silky surface finish. This careful attention helps assure a rope which will perform successfully.

It's just one more reason why your Wickwire Distributor knows he's got top-quality rope, slings and strand to sell . . . and that these products will serve you well.

4083

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

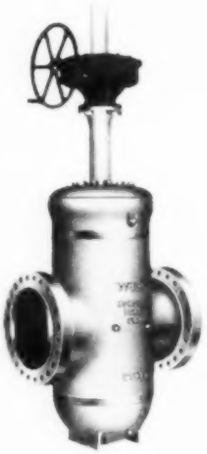
W-K-M VALVES
Smooth the way on the "Muskrat Line"

Two hundred million cubic feet of gas per day will flow smoothly through TGT's 355-mile "Muskrat Line." There'll be no turbulence — no restriction to flow set up by the mainline valves, because they are W-K-M Through-Conduit Parallel Expanding Gate Valves. These efficient valves assure full volume — smooth flow — all the way. Scrapers will go through them as easily as they do through the pipe.

The through-conduit design provides a valve bore the same I.D. as the pipe. The parallel expanding gate with LEVERLOCK* operation provides positive, easy opening and closing; upstream and downstream sealing; no surge closing. W-K-M Valves can be repaired, and seats replaced, if ever necessary, without removal from the line.

For proved performance and minimum maintenance, specify W-K-M Pipeline Valves. Ask your W-K-M Representative or write today for new Pipeline Valve Catalog #300.

*Trade Mark of W-K-M Manufacturing Company, Inc. 5616



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W-K-M	acf	KEY
THROUGH-CONDUIT GATE VALVES	LUBRICATED PLUG VALVES	RETURN BENDS AND FITTINGS

ACME-NEWPORT STEEL COMPANY

Newport, Kentucky

EFFECTIVE September 14th, 1956, the property and facilities formerly owned and operated by the Newport Steel Corporation, are now owned and will be operated by the Acme-Newport Steel Company, a wholly owned subsidiary of Acme Steel Company, Chicago, Illinois.

Acme Steel Company has been in business for 76 years and produces hot and cold rolled strip steel at its Riverdale Mill adjacent to Chicago. Our Company has developed a substantial business in special steel products such as Steel Strapping—Stitching Wire—Container Hoops—Floor Plate—Dexion Slotted Angle—Galvanized Flexible Conduit and other specialty products.

Acme-Newport Steel Company will continue to produce its present line of products. These will eventually be augmented by more steel specialties.

Present Newport Steel management will continue to administer the business with A. P. Miller as Vice President and General Manager, and Carl M. Riefkin as Vice President in Charge of Sales.

The consolidation of Acme Steel and Newport Steel brings many advantages to both companies and holds promise for more flexible application of their combined facilities to better serve users of steel throughout a broad range of industries.

Acme Steel Company, through its subsidiary the Acme-Newport Steel Company is happy to become part of the great Ohio Valley community and looks forward with confidence to participation in the growth and development of this prosperous area.

We welcome into the Acme Steel family all the present employees of Newport Steel. Their cooperation is sought in making this affiliation a successful enterprise . . . an enterprise which will result in benefit and security for our employees, our customers, the community of which we are a part and our thousands of shareholders.

Carl J. Sharp,
Chairman of the Board, Acme Steel Company

Frederick M. Gillies,
President, Acme Steel Company

ACME STEEL COMPANY, *Chicago, Illinois*

Now to supply **both** Power

Clark introduces

Mark TA Features

Quick starting—2 minutes to full load
Quick shutdown—instantaneous—no turning gear
Field proved—forty units delivered
Light weight—less than 6 tons
Compact—only 16′ long, portable
Long life—conservative blade temperatures
Air cooled—long life—cool outer surface
Packaged—shipped assembled, ready to install
Fuel versatility—liquid or gaseous
Installation flexibility—up or down duct connections
Variable speed—physically separated turbines
Single combustion chamber—lasts a lifetime

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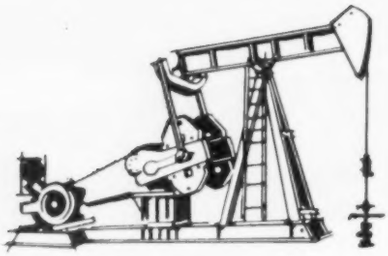

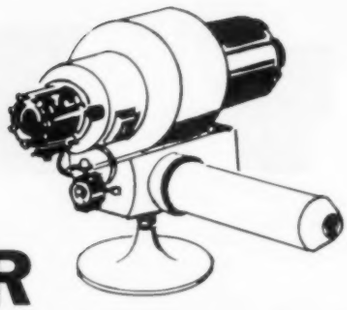

from WELL to BURNER

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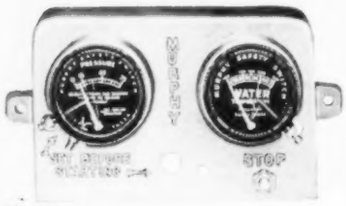
serve the petroleum industry



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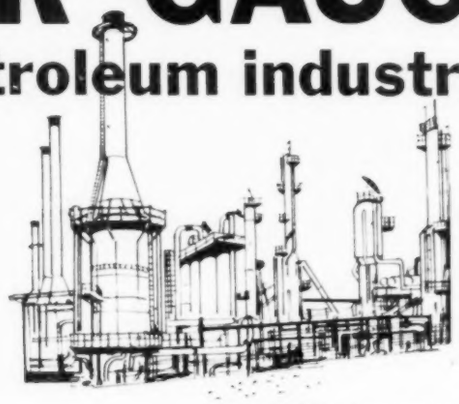

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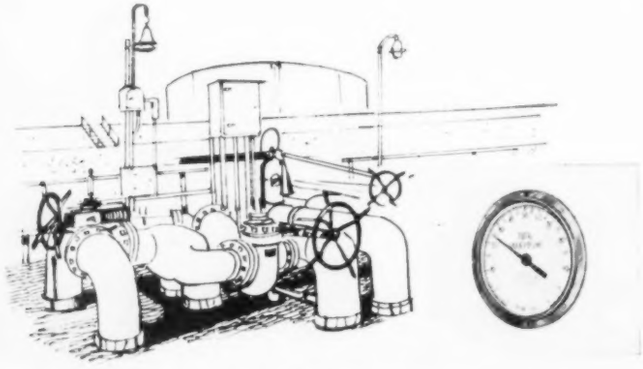
RMC's thermometer line above has found literally hundreds of uses in this important part of the industry. They give spot readings on: vapor and steam lines, pilot plant lines, water cooling and water condenser lines, fractionating tower lines, to name only a few.



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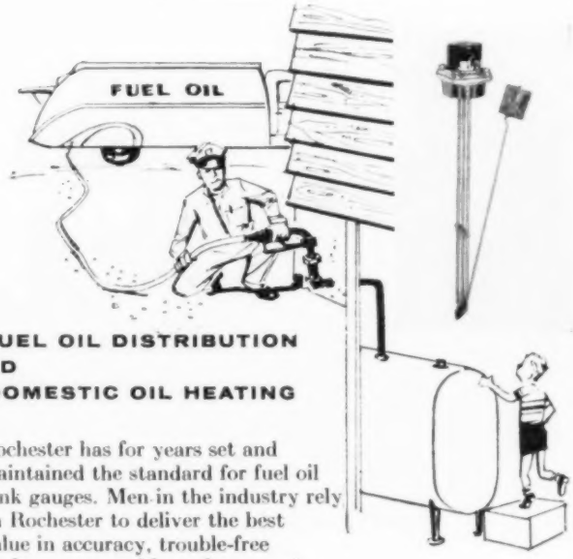

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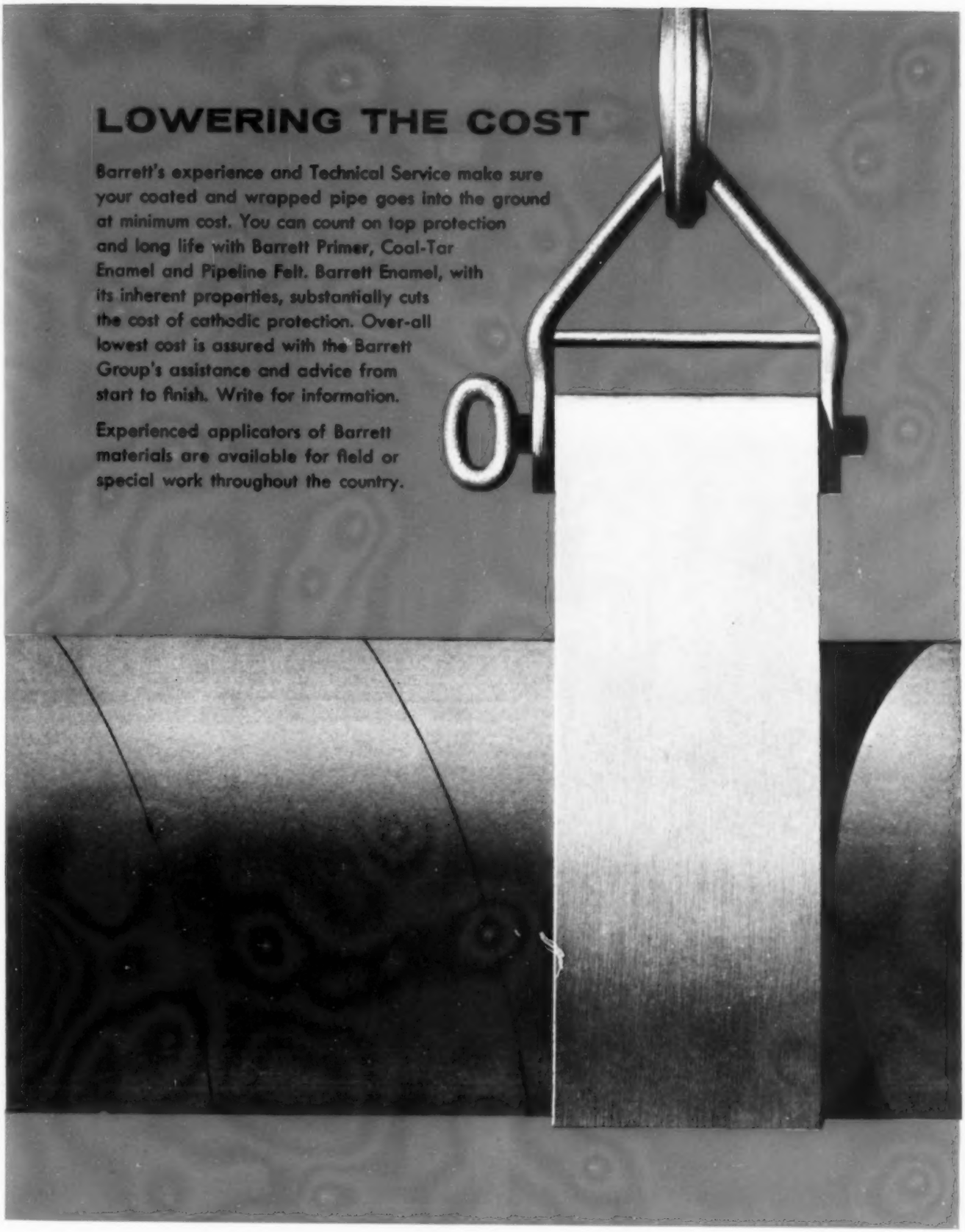

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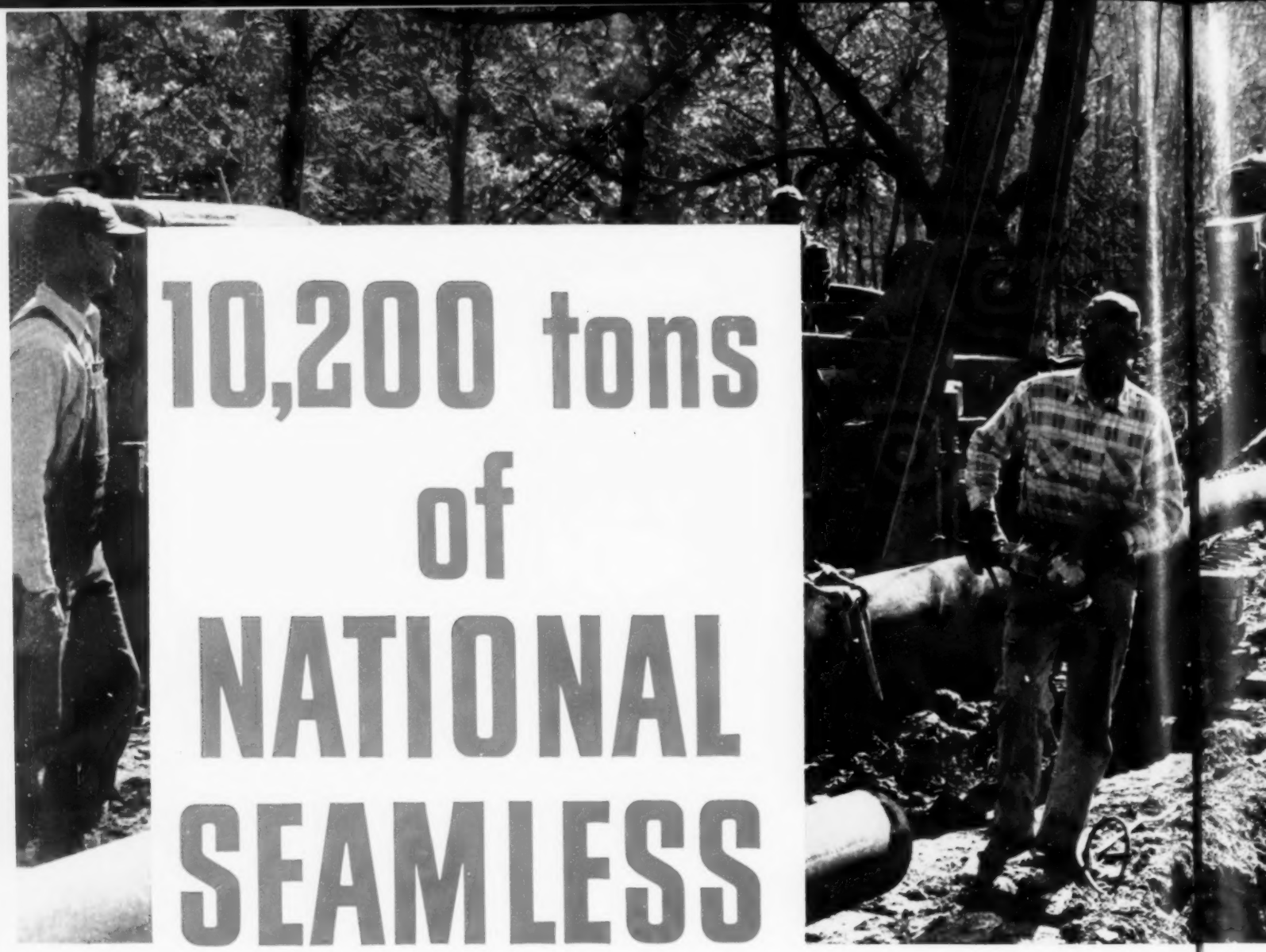

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A unique, $10 million, 10¾" O.D. pipeline is presently under construction for Pittsburgh Consolidation Coal Company. It will run from the Cadiz, Ohio area to the Cleveland Electric Illuminating Company's East Lake, Ohio, plant. Plans call for the line to carry 1,200,000 tons of coal a year. The coal is to be pulverized, mixed with water and pumped as a slurry to its destination. It will then be dried and processed prior to delivery to the consumer.

National Seamless Pipe is especially suited to rugged service such as this because of its strength, uniformity and flexibility. National Seamless is the pipe chosen consistently by engineers for every kind of pipeline. It gives long, dependable, trouble-free service. Specify National Seamless "Walls Without Welds" for your next job.

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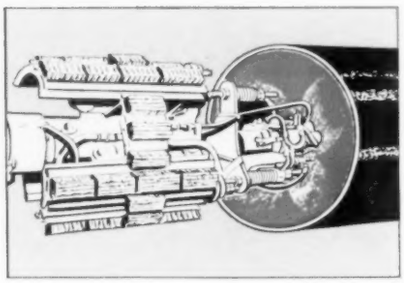
Copon internal pipe coating selected again by major gas transmission company



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VALVES

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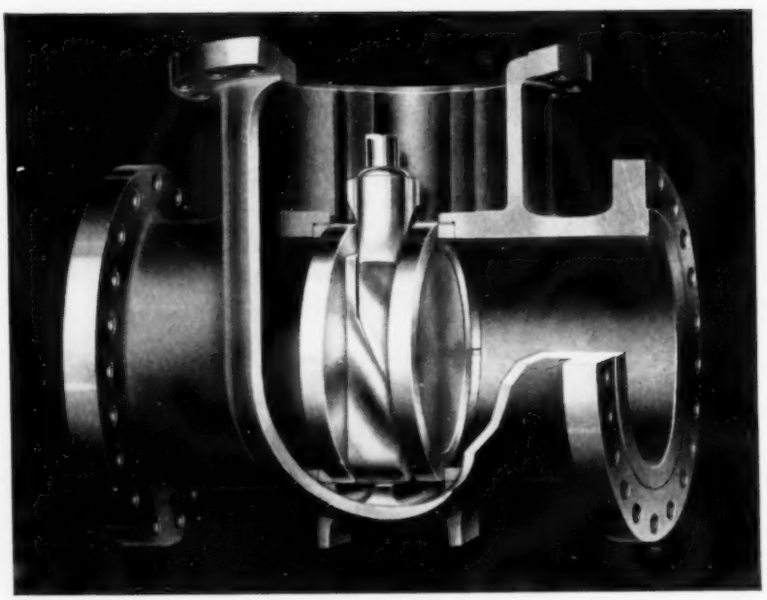
All right, here's a fact that Darling gate valve users everywhere will vouch for. The Darling *fully revolving double disc, parallel seat principle* means *easier* operation, *surer* closure, less chance of trouble, month in, month out. And you'll save on maintenance all along.

Why not check into Darling gate valves for your requirements? Find out *how* they assure these advantages. We'll gladly furnish general or specific details. Just say the word.

Above top: Darling 30" motor-operated gate valve powered by gas from line pressure.

Cutaway, below, shows simplicity of Darling's unique fully revolving double disc parallel seat gate valve principle—just four simple working parts—two plain interchangeable no-pocket discs and two husky wedges.



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Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

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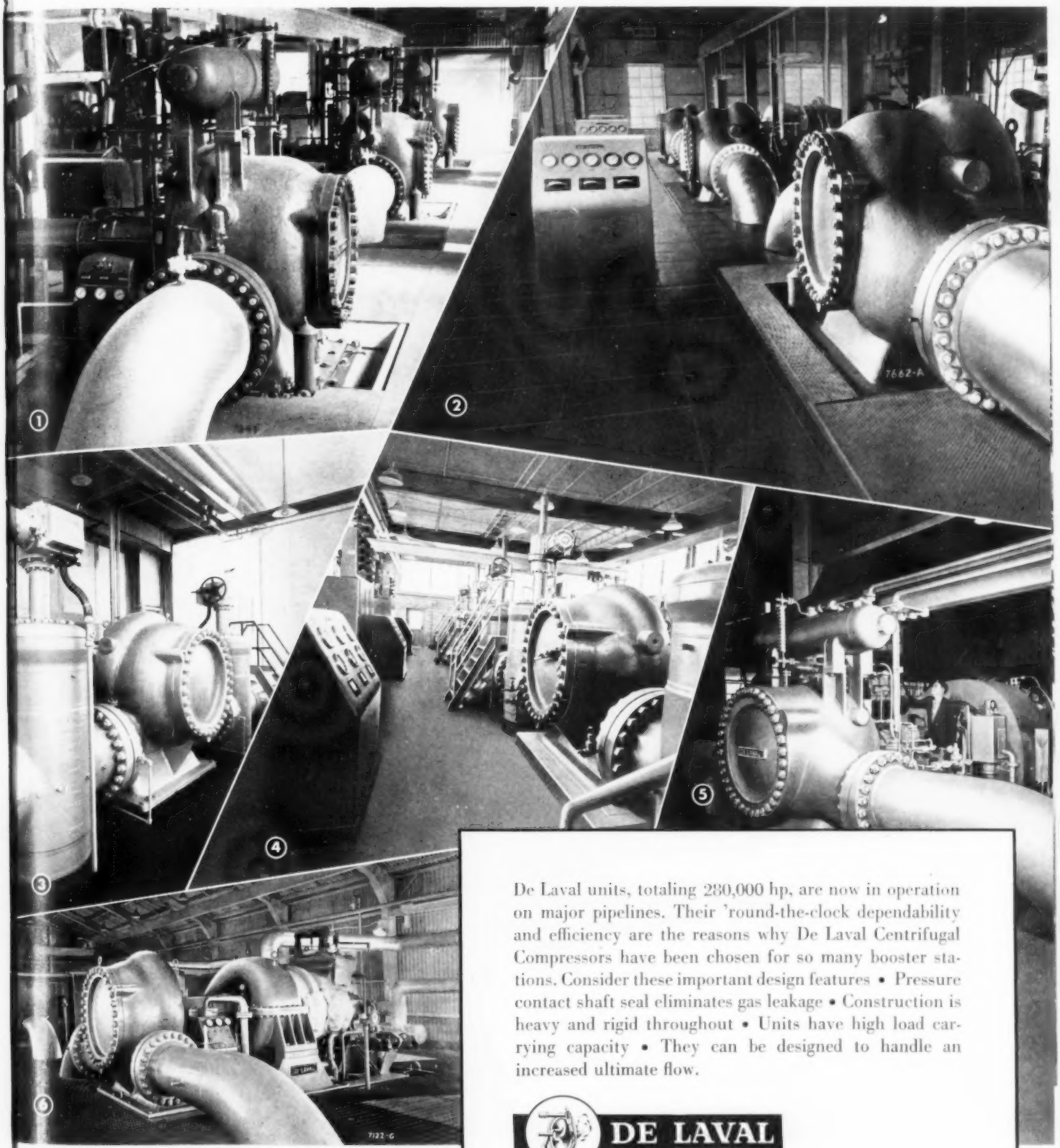

Located in booster stations of:

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De Laval units, totaling 230,000 hp, are now in operation on major pipelines. Their 'round-the-clock dependability and efficiency are the reasons why De Laval Centrifugal Compressors have been chosen for so many booster stations. Consider these important design features • Pressure contact shaft seal eliminates gas leakage • Construction is heavy and rigid throughout • Units have high load carrying capacity • They can be designed to handle an increased ultimate flow.

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Centrifugal Compressors

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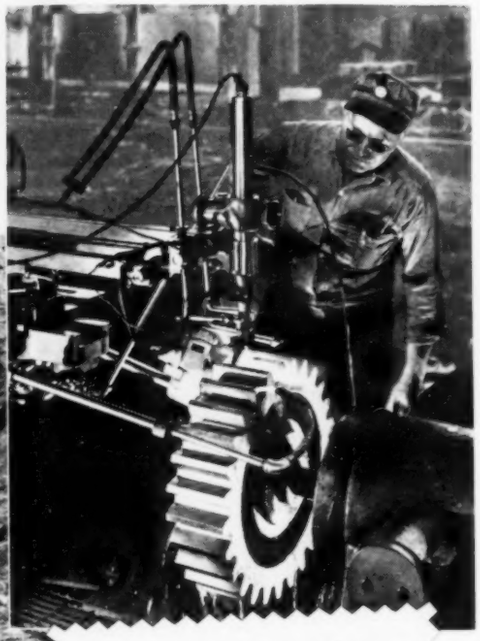
Setting the pace for fast-moving spreads . . .

This ¾ yd. 22-B is trenching on a road approach on the Saskatchewan pipeline in Canada.

BUCYRUS ERIE

22-B



Bonus Quality

saves you money

Bonus quality starts with highest grade steel which is flame-hardened to provide long-wearing gears and pinions.

Pipeline spreads fight enough obstacles — remote locations, tough terrain, bad weather — without having to put up with poor equipment. That's why contractors on fast-moving spreads like Bucyrus-Erie 22-B dragshovels — they know these rugged machines will set the pace and help them stay on schedule.

Bucyrus-Erie dragshovels are built for high-speed trenching. Speedy hoist and powerful digging strokes eat up maximum yardage in every shift. Responsive controls let the operator work at peak efficiency with little fatigue. Dipper design assures rapid filling and heaped loads, and clean fast dumps.

Most important, upkeep is low so you get maximum time on the job. There are few wearing parts and lubrication fittings are conveniently grouped and easy to get at. Dust shields protect the bearings of the track rollers from dirt and grit.

Your Bucyrus-Erie distributor will be glad to give you the complete details on the ¾-yd. 22-B dragshovel . . . and you'll be glad he did when you put it to work on your spreads.

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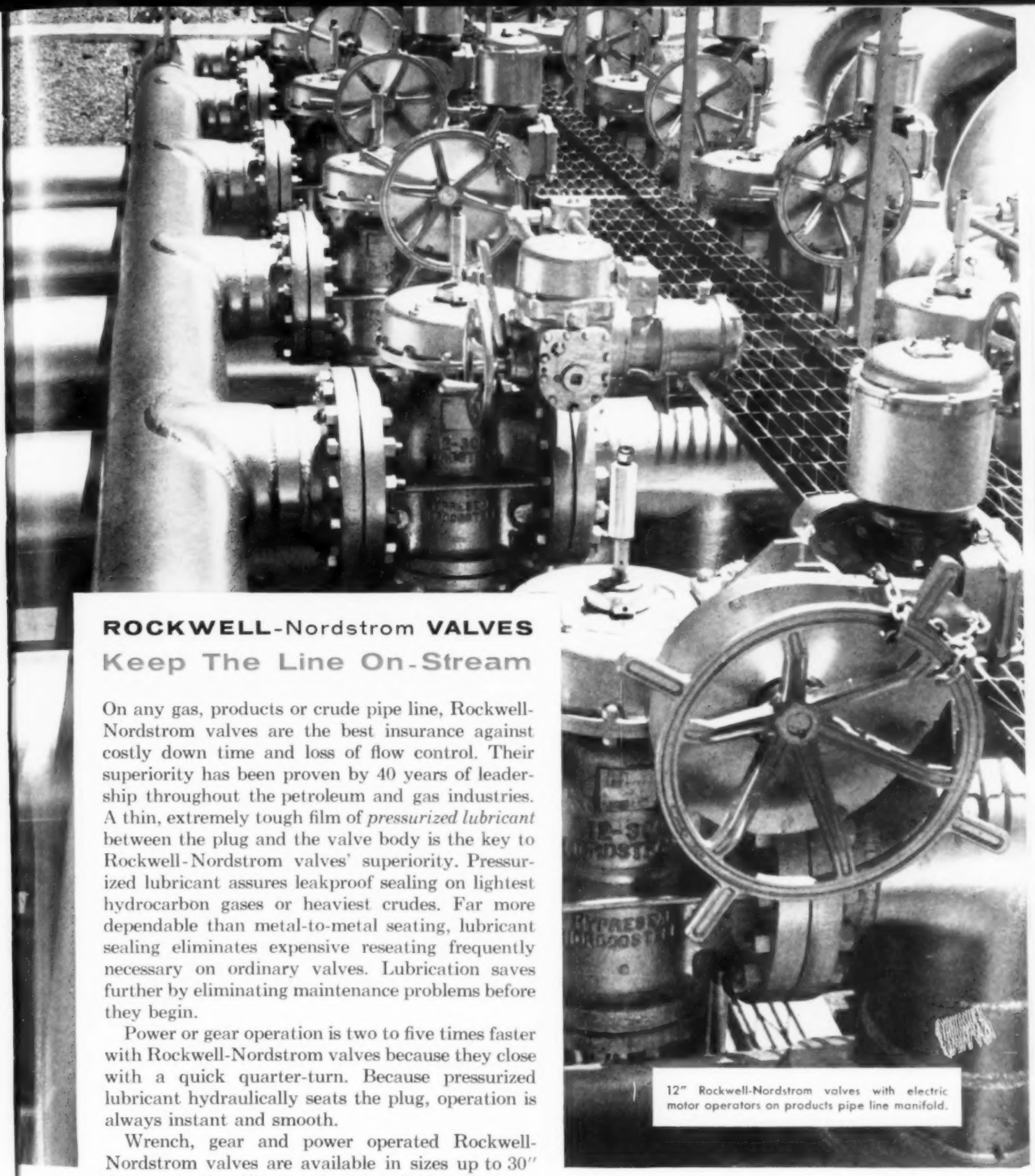

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On any gas, products or crude pipe line, Rockwell-Nordstrom valves are the best insurance against costly down time and loss of flow control. Their superiority has been proven by 40 years of leadership throughout the petroleum and gas industries. A thin, extremely tough film of *pressurized lubricant* between the plug and the valve body is the key to Rockwell-Nordstrom valves' superiority. Pressurized lubricant assures leakproof sealing on lightest hydrocarbon gases or heaviest crudes. Far more dependable than metal-to-metal seating, lubricant sealing eliminates expensive reseating frequently necessary on ordinary valves. Lubrication saves further by eliminating maintenance problems before they begin.

Power or gear operation is two to five times faster with Rockwell-Nordstrom valves because they close with a quick quarter-turn. Because pressurized lubricant hydraulically seats the plug, operation is always instant and smooth.

Wrench, gear and power operated Rockwell-Nordstrom valves are available in sizes up to 30" for every pipe line requirement. Write for more information: Rockwell Manufacturing Company, Pittsburgh 8, Pa.

Canadian Valve Licensee: Peacock Brothers Limited

12" Rockwell-Nordstrom valves with electric motor operators on products pipe line manifold.

40th YEAR ROCKWELL *of lubricated plug valve leadership*

ROCKWELL-Nordstrom VALVES

Lubricant Sealed For Positive Shut-off

Tandemed Clevelands set the pace on tough 78-mile line in North Carolina

PUSHING A 78-MILE NATURAL GAS LINE from Chapel Hill to Sanford, North Carolina, J. A. Jones Construction Co. of Charlotte used two Clevelands in tandem to set the pace on a tough construction job. The lead trencher, a Cleveland 95, opened up an initial cut to a depth of 2 feet. The second machine, a Cleveland 110, then dug the trench down to finished grade, an average of 3½ feet deep. Each cut was 18 inches wide.

Boulders, rock outcroppings and closely spaced culverts cut across the trench line every few feet. Rock blasting was required frequently with each shot covered by a heavy dragline mat. Three rock drilling crews were kept busy most of the time. In spite of the difficulties encountered, the job moved forward at the rate of a mile a day or better—trench dug, pipe joined and laid, and backfilling completed.

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PIPE LINE PANORAMA

Economic "Squeeze" May Avert War . . . What is next move if Nasser says "no" to U. N. decision on Suez? Put economic squeeze on Egypt with U. S.-Venezuela *Sea Lift*, say Government and industry officials. Plan is ocean-going version of highly successful Berlin Air Lift.

U. S. pipeliners will play major role if Sea Lift is used. Plans are for this country to provide Europe with upwards of 1 million barrels of crude a day—700,000 barrels of that amount will be transported to coast by pipe lines (predicted excess capacity). Remainder to be shipped via tank cars and trucks.

It is also predicted that in next decade the Free World will pull all stops to step up crude and products pipe line construction. Reason: After Nasser debacle, Free World wants to rid itself of dependency on Suez Canal.

Harbinger of action to come: Iraq Petroleum has confirmed reports that it is conducting preliminary surveys for 1200-mile pipe line from Persian Gulf through Turkey to the Mediterranean.

•

Tennessee Gas to Revamp Pipe Line System . . . Tennessee Gas is asking F.P.C. approval to launch expansion program that would double its gas pipe line capacity over original line built in 1943-44. Peak day capacity would be raised to nearly 3 billion cubic feet.

Project would include: 1085 miles of pipe line, six new compressor stations, enlargement of seven existing stations and new triple-line underwater crossing of Mississippi River. Estimated cost: $166 million.

•

Mountain Goes to Mohammed . . . Reversing the usual procedure, Southern California Edison, an electric utility company, will lay its own 200-mile gas pipe line system to Los Angeles from Richfield Oil Corp. producing properties in San Joaquin Valley. Richfield recently signed 20-year contract to provide Southern California Edison with $200-$300 million worth of natural gas.

•

Diversification Trend Continues . . . Pacific Northwest's subsidiary, Northwest Production, will purchase Western States Refining at Salt Lake City. Western States has 3500 bpd refinery at North Salt Lake City, 1200 bpd refinery at Farmington, N. M. and 121 gasoline outlets in New Mexico, Colorado, Utah, Idaho and Nevada.

El Paso Natural has awarded contract for construction of 7000 bpd refinery near Gallup, N. M., will eventually expand it to 13,000 bpd.

•

Three-Year Wait for Line Pipe . . . "It is difficult to obtain any (steel line pipe) delivery promise on a major trunk line project before 1959 from any producing mill," so states U. S. Steel's Henry J. Wallace.

Wallace also reported U. S. Steel is awaiting Washington approval of rapid amortization of cost of new capacity at McKeesport, Penn., and Lorain, Ohio, plants. If approved, new program will cover new steel capacity for increased production of seamless tubular products in the company's existing pipe mills and a new seamless mill.

The new additions would increase shipments of oil country goods by 80 percent, and also increase to a lesser extent production of seamless standard and line pipe.

First section of pipe is towed off the launchway on the north shore of Corpus Christi Bay. The 4000 foot string of 10-inch pipe moved into the water at speeds up to 240 feet per minute.

As the rear end of the string entered the water, additional tugs were added to the tow to speed the bay crossing. Sideboom tractors move

'Sea Train' Methods Used to Cross Corpus

Pipeliners fought waves four feet high and winds up to 35 miles per hour to tow 4000-foot sections of 10-inch concrete-coated pipe across bay. When in position, tie-ins were made using a new 'sideboom' barge to control ends of sections for over-water weld.

By MELVIN A. JUDAH
Editor, PIPE LINE INDUSTRY

ADVANCED METHODS of submarine pipe line construction first proposed for long offshore pipe lines early this year (See PIPE LINE INDUSTRY, May 1956, Page 32) have proven successful in their first trial. A novel method of towing long sections of line afloat off of a shore launchway and making tie-ins over water led to completion of a 60,000-foot submarine line across Corpus Christi Bay in only 80 working hours.

Fifteen 4000-foot sections of 10-inch concrete coated line were made up on the shore launchway and towed into position in a fairway across the bay. As each pipe section neared location enough pontoons were released to allow it to rest lightly on the bottom. Tie-in welds were completed with an anchored "sideboom" barge that lined up the pipe and supported ends of both sections under positive control.

Collins Construction Company completed the crossing in five 16-hour working days. The completed line will extend across Corpus Christi and Oso bays to link the Reynolds Metals Company plants at La Quinta, Texas, with Humble Oil & Refining Company's Flour Bluff gas supply south of Corpus Christi.

Corpus Christi Bay provided the ideal place to try the "Flotation Inversion" method developed by Sammy Collins and his submarine pipeliners. Waves swept up by 30 to 45-knot afternoon winds would have been a tough problem for other proven methods of submarine construction. In addition, most of the line fairway cut across areas restricted for the use of

up to shift the next string onto the launchway. Fifteen strings were launched in this manner to complete the 60,000 foot crossing.

At the seaward end of the floating string of pipe, tugs move into position near the tie-in barge. Average speed of the tow across the bay was about three knots. Pontoons were then released at intervals to allow the pipe to settle lightly on the bottom during tie-in.

Christi Bay in Five Days

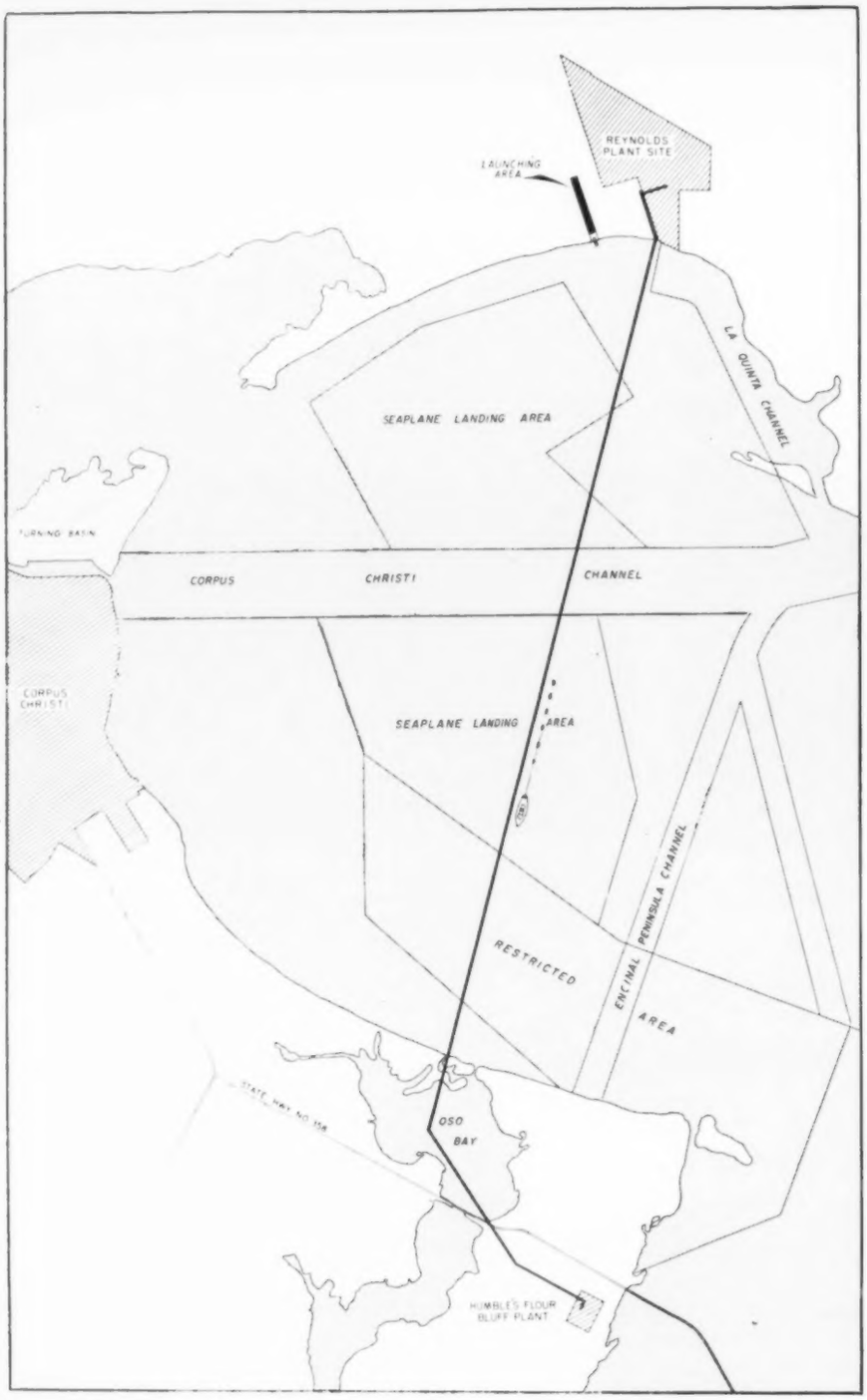
U. S. Navy seaplanes and interference with scheduled operations had to be avoided. But the most important advantage for future longer submarine lines is that the fast method exposes equipment and men to the minimum chance of bad weather during seasons when Gulf waters can suddenly become rough.

Pipe Sections Towed Afloat. Joints of pipe were welded into 4000-foot sections on a shore workway near the Reynolds plant on the north side of the Bay. Each weld was examined by Collins' new X-ray mobile laboratory; an average of 130 welds were completed daily. Field joints were protected with coating plus expendable field molds for concrete. Pontoons were then banded to the pipe, ends were plugged, and the section was ready for launching and towing to location.

The first joint of pipe was towed across Corpus Christi Bay to a point near the mouth of Oso Bay. Pipe was launched at a rate of up to 240-feet per minute. Even in 2 to 3-foot seas, tugs towed joints to fairway locations at a speed of 3 knots. When surface waves made towing difficult, pontoons were removed from the pipe at intervals to allow it to rest lightly on the bottom. Towing then proceeded with little interference from surface weather.

"Side Boom" Barge Made Tie-Ins. Construction progressed northward across the Bay as each joint was tied-in. A newly designed anchor barge used four "side booms" to lift ends of both sections of pipe just above the surface of the water and support it during line up and welding. Its four anchors were carefully controlled from a central station to maintain proper break-over. About half of the pontoons were left on each towed section until after tie-in was completed. After the over-water weld was completed, X-rayed and field-coated, pontoons were removed. Several pontoons were left on the north end of each newly completed pipe section to reduce its weight in water during the next tie-in and prevent damage to the coating. Average time required for overwater tie-ins was three hours. This method was repeated until the 60,000-foot crossing was completed.

Navy Seaplane Operations Carried Out in Area. At the start of each day's laying operations, construction crews contacted U. S. Naval Air operations officers about plans for the day to make sure that construction work would not interfere with seaplane operations. Using this laying method there was never more than a few thousand feet of the operating area used for laying. During most of the laying operations only the small



Reynolds' 12-mile Corpus Christi Bay crossing was laid in only five days. 4000-foot strings of 10-inch concrete coated pipe were made up and towed into the bay from the launchway adjacent to the La Quinta plant. Towing operations were coordinated daily with Navy seaplane operations in restricted bay areas.

area just around the barge would have pipe at the surface.

Fairway Bottom Surveyed and Cored. Prior to actual construction, surveys were made along the crossing fairway. Cores were taken to depths of 6-15 feet on 500-foot centers. Most of the bottom was sand and mud with some sections of shell reef dispersed in the bay. Bacterial analysis was made on cores to check for sulfate reducing bacteria and marine borers.

A 2-inch coating of 140 pounds per cubic foot concrete was specified to give the pipe equilibrium in 95 pounds per cubic foot fluid. This value was based on the results of bottom surveys. Pipe was protected with a double coat of coal tar enamel, glass fiber wrap plus a wrap of pipe line felt.

Line Tested With Air and Hydrostatically. Each 4000-foot section was tested with air to 500 pounds per square inch for 24 hours on the pipeway before launching to check for pin hole leaks. When completed the entire line will be given a hydrostatic test at 1250 pounds per square inch.

Trencher Will Bury Pipe to Depth of Five Feet. Reynolds Corpus Christi Bay crossing was designed for a minimum cover of three feet. Pipe will be at least 54 feet below mean low water under both the main Corpus Christi channel and the Reynolds channel and turning basin. Water depth in the bay ranges to a depth of 15 to 16 feet. After the section of line is complete across Oso Bay, the entire line will be buried with a jet trencher to a depth of five feet below the bottom.

Design, engineering and inspection on the crossing were handled by Pipe Line Technologists of Houston. Application of protective and weight coating systems was completed by Rosson-Richards Company. Jess Edwards handled the stringing of the pipe along the launchway.

Overwater tie-in was completed alongside this newly designed barge. Four sidebooms cradle the ends of two pipe sections for line-up and welding. Here the weld has just been completed and two of the barge's four anchors have been hoisted clear of the water.

Four anchors of the tie-in barge are precisely controlled from this four-drum winch station. One operator handles all mooring cables to achieve positive control during line-up without the time delays of signals between two or four separated stations.

New mobile X-ray trailer unit is completely equipped with the latest X-ray processing equipment. It is capable of turning out over 1000 sheets of processed X-ray film daily.

All welds on the 60,000-foot Corpus Christi Bay crossing were inspected by Collins' new mobile X-ray equipment. Here a shot is taken on a joint on the shore pipe welding ways, overwater welds were inspected in the same manner. Using two units, 130 circumferential welds were inspected per day.—The End.

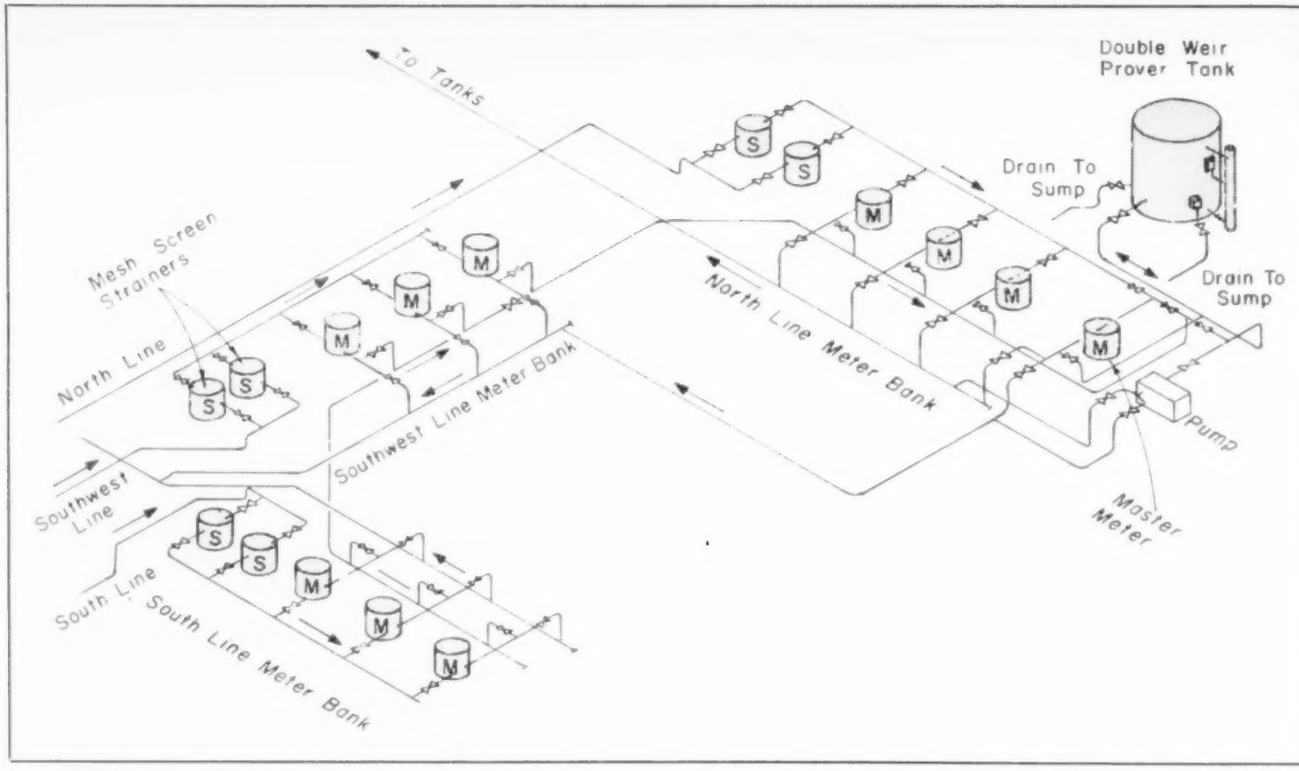


FIGURE 1—Typical piping arrangement of a trunk line meter delivery terminal.

Interstate reports on . . .

140 Million Bbls. of Crude Measured by PD Meters

Four years experience with positive displacement meters has demonstrated the reliability of this method for measuring crude oil.

By D. C. McKINLEY
Interstate Oil Pipe Line Company
Shreveport, La.

BASED ON FOUR YEARS of operating experience and 140 million barrels of crude oil successfully measured, Interstate Oil Pipe Line Company is ready to add its endorsement to the positive displacement meter as an accurate and reliable measurement facility.

During this four-year period, PD meters were introduced, tested and adopted by Interstate. Growth of meter acceptance has been rapid. In 1952 three small meters were in operation for test and observation purposes only; today there are approximately 60 meters in operation measuring approximately 400,000 barrels per day. Of this amount, 375,000 barrels per day are custody transfer measurements. Custody transfer of oil on meter measurements is conducted with six non-affiliated companies in addition to three affiliated organizations.

Experience has revealed that the frequently mentioned obstacles to crude oil meter operation are largely imaginary. Meter performance and maintenance experience indicate that crude oil is a very suitable medium for meter measurement.

How to Select a Meter. There are many important items to be considered in selecting positive displacement meters for oil pipe line service. Perhaps the most significant are these meter characteristics and also manufacturer's attitudes:

- A flat characteristic curve over the expected operating flow range.
- Low head loss across the meter at the maximum flow rate.
- Clearances of sufficient magnitude to accommodate highest viscosity fluid expected.
- Temperature compensation.
- Over-all simplicity of mechanism.
- Cooperation and service readily available from the meter manufacturer.

It is a good idea to contact several manufacturers by letter, stating clearly and concisely the existing operating conditions and fluid characteristics. Interstate also advised them that PD metering was not currently used in our operation, thus indicating an open mind with respect to types of

meters or manufacturers.

For simplicity in operations and maintenance, it was decided to refrain from experimentation with meter types and makes until after personnel were more familiar with the basic principles of meter measurement. Experience has proved this a good idea.

This doesn't mean other types or makes are ruled out. Company engineering and research groups are constantly seeking better PD meters and investigating meters based on other principles of measurement. A number of these devices will be placed under field test soon at carefully selected locations under the supervision of trained personnel.

Of the many types of PD meters now available commercially, perhaps the most promising for use in oil pipe line service are these:

- Sliding vane
- Lobed impeller
- Rotary bucket
- Oscillating piston

Interstate's successful experience has been with the sliding vane type; however, the others offer advantages, too.

Installation of Piping. Piping arrangements for PD meters in oil pipe line service should follow the established patterns used in product pipe line installations or as outlined in ASME-API Code 1101. There are, of course, special service installations which require individual consideration.

To successfully meter oil transported by truck, experience led to a simplified equipment arrangement. The only auxiliary items include a deaerator, strainer and back-pressure valve. Recent installations have added a pipe line type sampler to obtain a representative sample from which a BS&W determination can be made.

A conventional type 20-barrel volumetric prover tank is used for calibration. At one installation, selsyn type transmission is used to print tickets in the station office some 500 feet away from the meter location.

About 10,000 barrels per day of oil transported by truck is being measured by PD meters at eight different locations. Of this quanity, approximately 4000 bpd is on a custody transfer basis.

Measuring From Lease Tankage. Equipment for measuring oil from lease tanks generally includes an air and vapor separator, liquid level control, automatic pipe line sampler, strainer and in-line thermometers. A conventional volumetric prover tank was used for calibrating the meters. Meters are located between the lease tanks and the pipe line pumps. At one location, a test of approximately three months' duration was conducted to compare the meter measurement with the lease tank measurement. Approximately 870,000 barrels were measured with a net result of .02 percent less volume by meter than by tank measurements. There are no custody transfer measurements now being made from lease tanks; however, plans are well advanced for their use in our operations.

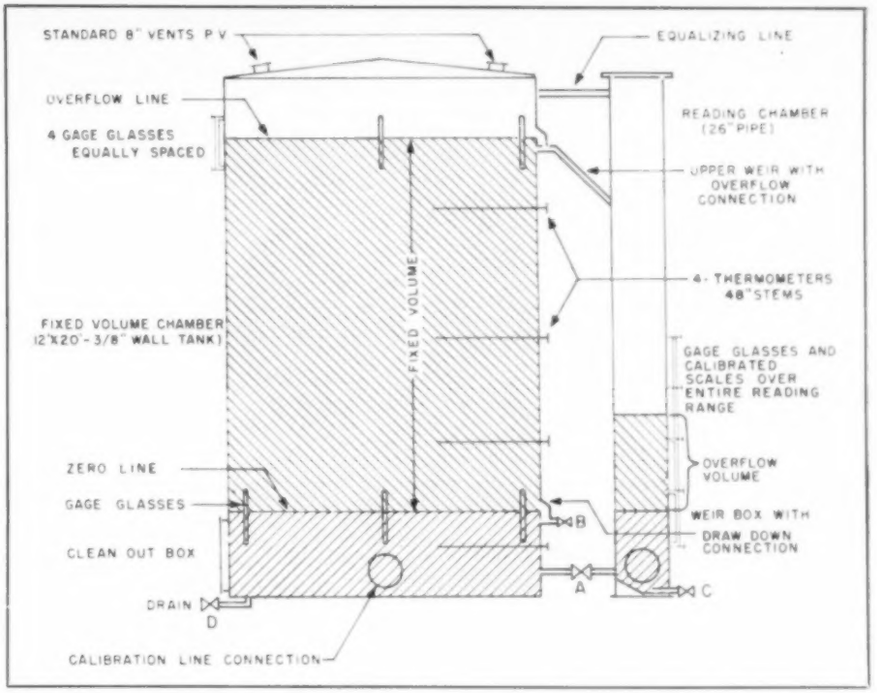


FIGURE 2—Development of larger capacity meters led to the design of this 300-barrel capacity double weir type prover tank.

Measuring Trunk Line Movements. A typical piping arrangement of a trunk line meter delivery terminal is shown in Figure 1. At this location there are ten 68,000 bpd meters measuring three streams totaling approximately 260,000 bpd. Meters are so arranged that streams can be measured independently for dispatching control. Two of the three streams are then blended together immediately after being metered.

A master meter and a volumetric type prover tank are connected in a manner such that any meter can be readily calibrated by either method. The prover tank has a 300-barrel rated capacity and is of an unconventional size and design. Conventional strainers with one-fourth-inch mesh screens and drain lines are provided. The calibration tank pump is one of conventional type.

Twin discharge lines from both the master meter and the pump divert the oil used for calibration back to the proper stream. Samples are automatically withdrawn from side streams circulated through the nearby sample room.

In designing an installation of this type, arrange piping so that all drainage and sump pumpings will be returned to the system on the same side of the meters as that from which they came. This dictates that the sump discharge should be connected to the downstream side of the meters since oil drained from the calibration tank must be returned to the downstream side of the meters.

At this and a nearby installation approximately 140 million barrels of crude oil have been successfully measured using PD meters. Accuracies are considered better than those previously obtained by the tank gaging method. There have been no meter failures or shutdowns caused by meter operation.

Other trunk line meter installations employing 4-inch meters have likewise proven successful. At one such location we are receiving custody transfer oil on meter measurement

FIGURE 3—Experience at meter banks such as this one with calibration pump and prover tank indicates that increased measurement accuracy rather than labor saving justifies the use of meters as a means of measurement.

basis. This and other successful meter experience assures us that PD meters for trunk line service are a practicable and desirable method of measurement in trunk line operations.

Calibration Facilities and Procedure. The most common concern voiced in connection with oil meter proving is that wax and foreign material may be deposited in the proving facility. Some feel that gravimetric proving is the proper solution to this problem. It may well be, especially under abnormal climatic conditions or on certain oils with extreme characteristics.

At Interstate, however, this problem has not been as serious as often reported. After thoroughly considering the advantages and disadvantages of gravimetric and volumetric proving methods, only volumetric provers were installed. The chief disadvantages of gravimetric proving are the problems of accurate specific gravity determination, limit to prover capacity, cost of facility, and more complicated determinations for operators.

Conventional Types Used. Conventional type tanks were selected for the first installations. By controlling the operating procedure serious trouble from the deposition problem was prevented. On one installation handling wax oil transported by truck a frequent flushing of the tank is required. Fortunately, sizable quantities of condensate, which is a very effective cleaning medium, are trucked to the same location.

At trunk and gathering system installations experience showed that the normal variation in grades of crude handled keeps the prover tanks clean. Meter factor records indicate very satisfactory proving results.

300-Barrel Double-Weir Tank Proves Large Meters. Development of larger capacity meters led to the design of a 300-barrel capacity double weir type prover tank shown in Figure 2. The prover is based essentially on the principle of a fixed volume between two knife-edge surfaces. It consists of a vertical cylindrical tank equipped with an overflow line connected to a cylinder of reduced cross-section mounted alongside the fixed volume section. The smaller section is graduated and connected to the fixed volume section in a manner such that the total volume run through the meter can be accurately read as the sum of the known volume between the knife edges plus the volume that overflows into the smaller section.

The fixed volume chamber is made from a standard welded lease tank, except that a ⅜-inch minimum wall thickness is used to insure against damage in handling. At a level of about three feet above the tank bottom a slot is cut in the shell approximately 18 inches long parallel to the tank bottom and approximately two inches deep. The lower edge of the slot is beveled to a knife edge. This slot is enclosed by a box on the outside welded to the shell of the tank. It has an outlet in the bottom equipped with a draw down valve. A similar weir is constructed on the shell of the tank approximately two feet down from the top; this weir has an overflow connection to the reading chamber.

Eight 24-inch gage glass columns are located on 90-degree spacing around the shell of the tank in line with both the top and bottom weirs. The tank is equipped with a clean out box, a bottom drain, pressure vacuum vents, and a calibration line connection such that the flow of the liquid into the tank will not cause surface disturbance. Four long stem thermometers extend into the tank for a distance of at least one-third of the tank's diameter.

A cylindrical reading chamber of smaller diameter has gage glasses on the lower one-half of the section. The overflow connection enters the reading chamber at a point well above the top of the reading section. An equalizing line and a clean out manway are installed as indicated. The bottom of the reading chamber is equipped with a conical draw-down connection

In crude oil and corrosive fluid service the interior surfaces of both

FIGURE 4—On Interstate's small meters with two million barrels throughput, maintenance has been limited almost entirely to inspection labor cost. For larger meters, the total parts cost has been approximately $150 per meter or $6 per million barrels throughput. The meter bank shown above is equipped with 10-inch meters and header.

the fixed volume tank and reading chambers should be coated with a suitable protective coating material.

Establishing Prover Tank Volume

1. First Mark Bottom Zero Line

With valve "A" open, fill the tank and reading chamber with water to a level about three inches above the bottom weir. Close off the water supply, then open valve "B" and drain the water from the bottom weir box connection until flow ceases. Then make temporary zero line identification marks on the shell of the tank and the reading chamber opposite the liquid level in the gage glasses. Add water and repeat the procedure until the zero line has been definitely established: a minimum of three checks are made. This provides permanent reference marks for the bottom zero line on the tank and reading chamber shells.

2. Mark Overflow Line at Top Weir

After the bottom zero line has been established, close valve "A" and fill the tank until it freely overflows the top weir into the reading chamber. When the flow over the top weir ceases, make temporary overflow line identification marks on the shell of the tank opposite the liquid level in the gage glasses. Draw approximately three inches of water from the tank, then refill it again to freely overflow the top weir a second time; make sure the level in the reading chamber is well below the overflow connection. Repeat the operation a minimum of three times or until a definite overflow line has been established. Then make permanent reference marks on the shell of tank at overflow line.

3. Measure Volume of Tank Between Weir Levels

After the overflow line has been established close valve "A" and drain the reading chamber through valve "C." Connect the withdrawal hose to the tank at some convenient valve below the bottom zero line and fill the withdrawal equipment with water. All air must be purged. A pump may be used if it can be purged of all air and has no leaks. Fill the tank until it overflows the top weir; then disconnect the water supply.

Check all connections for leaks and make certain that the liquid level in the top gage glasses corresponds to the permanent reference marks for the overflow line. Begin the withdrawal into a supplementary test measure, recording the volume and temperature of each withdrawal. A 500-gallon portable prover tank previously calibrated by approved methods serves as a good supplementary measure. Continue withdrawals until the liquid level approaches the bottom zero line observed in the lower gage glasses. Condition of withdrawal equipment and pump should be the same at the end of the last withdrawal as it was at the beginning of the first. Close the valve on the tank through which the withdrawal has been made. Drain remainder through valve "B" into an appropriate smaller measure until flow ceases.

FIGURE 5—This truck-unloading meter stand is equipped with a conventional 20-barrel calibration tank. A simplified arrangement includes auxiliary items such as a de-aerator, strainer and back-pressure valve. About 10,000 bpd of oil transported by truck is being measured by Interstate with PD meters at eight different locations.

About the Author

D. C. McKINLEY, senior oil measurements engineer for Interstate Oil Pipe Line Company for the past four years, has been responsible for the introduction and adaptation of PD meters to crude oil service. McKinley had his initial PD meter experience as meter foreman for the Products Pipe Line Company in 1941. Currently he is representing Interstate on API and other industry committees concerned with the measurement of hydrocarbons.

Examine the liquid level indicated in the lower gage glasses. If the liquid level coincides with the permanent reference marks opposite each glass, then the total volume withdrawn (corrected for temperature effect) is recorded as the fixed volume of the prover at 60° F. and atmospheric pressure. This volume includes the internal volume of the tank between the upper and lower weirs; the contents of the lower weir box; plus the contents of connections to valve "B." This is recorded as the rated volume of the prover.

4. Calibrate Reading Chamber

First close valve "A" and fill the reading chamber with water to a level near the top of the reading range. Disconnect the water supply; connect the withdrawal hose to valve "C" and fill it with water, making certain it is free from air. Observe all connections for leaks. Make a temporary reference mark on the shell of the reading chamber opposite the liquid level and wait for a period of five minutes to make certain the liquid level remains constant and that the system is free from leaks.

Record the opening temperature and start drawing into the five-gallon test measure. Mark each five-gallon decrement on the shell of the chamber; continue the withdrawal until the level has been reduced to a point near the zero line reference mark. Measure the over-all height of the reading chamber between the top reference point and the liquid level after the last withdrawal. Using the temperature corrected volume measured and the length of the chamber displaced, compute the length of the

chamber equivalent to .01 of a barrel. This is the basic increment used to prepare the reading scale.

5. The Last Step Is to Mark and Mount Scales

Reading scales are prepared by scribing lines at .01 barrel increments on a metal strip; preferably brass or stainless steel. The interval between lines will be governed by the diameter of the reading chamber and is determined by the water calibration method.

After scales have been scribed they are numbered and mounted so that the point on the scale representing the rated volume of the prover, shall be matched exactly with the permanent zero reference point on the reading chamber. This locates the mark representing the rated volume of the prover tank at the same elevation as the knife edge on the lower weir. Scales are continued upward to provide a reading range of approximately four barrels. Scales so marked and mounted will be direct reading and will show the sum of the fixed plus the overflow volumes. This is the measured volume by prover tank.

Proving Meters by Double Weir Tank. Metered liquid is turned into the tank through the calibration line with valve "A" open; both the fixed volume chamber and the reading chamber are filled. The tank is then emptied to a level slightly above the bottom weir using the calibration pump. A liquid level control is a convenient method of shutting down the pump at the proper time. Valve "B" is then opened and the remainder of the liquid above the bottom weir is drained to the sump.

Allow a waiting period to permit the liquid level to establish itself at the bottom zero line. Check the levels in the gage glasses on the fixed volume tank and reading chamber to make certain that the liquid level coincides with the prover zero line. Close valve "A" and deliver through the meter to the prover tank a volume just sufficient to overflow the top weir. There is a convenient way to control this, especially with large capacity meters. Add the rated volume of the prover to the initial meter reading; then use this sum as the target reading at which the meter should be stopped. After the valve is closed, allow the fluid to overflow into the reading chamber until the flow ceases. Use approximately the same waiting period for the bottom weir rundown.

Read the volume delivered opposite the calibrated scale on the reading chamber. Record and average the temperature readings on the four thermometers. Since the liquid in the space below the bottom zero line is displaced and agitated during each run, its temperature is considered the same as the average for the full tank. This procedure is repeated until sufficient runs have been made to obtain a satisfactory meter factor.

Frequent Inspection. From time to time, the interior surfaces of the prover are visually inspected for incrustation or wax deposit. Entry into the tank is through the clean out box. Frequent inspections are also recommended to make sure the top and bottom weir overflow levels remain constant.

Interstate's results with the double weir prover have been very satisfactory. It has been used to calibrate meters delivering 50 barrels per minute. During a ten-month operating period approximately 75 million barrels of oil have been delivered using the tank as a prover for the meters.

A second tank of this same design has recently been installed by Interstate at another location. This type prover has several operating advantages:

- Tank can be enlarged to accommodate meters with capacities exceeding 10,000 bph.
- Simple to operate.
- Low construction cost.
- Provides longer calibration runs which more accurately reflect true meter performance.

Maintenance Cost Figures. Interstate's maintenance cost data are based on limited experience so general cost figures should be used with caution. On small meters with two million barrels throughput, maintenance has been limited almost entirely to inspection labor cost. There has been some replacement of temperature compensation devices plus two rotating elements. Expressed on a dollar per million barrel throughput basis, the figure for the entire number of meters is insignificant.

For larger meters, the total parts cost has been approximately $150 per meter. Each metered about 25 million barrels so this cost was only $6 per million barrels throughput.

Meter Maintenance. The responsibility of meter maintenance in each district has been placed with the existing mechanical forces. In some districts, meter service is regarded as a specialty, but only in the same sense as are magnetos, water pumps or other auxiliary items of equipment. Only a very limited amount of training and familiarization is required to acquaint the average mechanic with the essentials of meter maintenance.

In the case of the larger meters, inspections are conducted at regular intervals by the mechanical gang under the close supervision of the mechanical foreman. Preventive maintenance practices plus liberal parts replacement at time of scheduled inspections assures reliable and uninterrupted meter operation.

At Interstate, meters have been successfully used to measure streams with characteristics varying from 40 to 500 SUS viscosity; 20° to 110° API gravity, Reid vapor pressure from 3 to 62 psi; paraffin and asphaltic base crudes; flow rates from 40 to 3000 bph, and under other circumstances often considered objectionable to meter operation. Even so, from these experiences, it is felt that the use of PD meters in oil pipe line service has proven to be a sound and reliable practice.

Economics Depend on Many Factors. Economics of meter measurements is a study in itself. Any factual statements with respect to the economy of using meters would certainly require qualifying and supporting details. For example, installing and maintaining meters for measurement purposes only on a new system of 100,000 barrels per day capacity having an installed cost of $40,000 to $50,000 is obviously more desirable from an economic viewpoint than the construction of three 55,000 barrel tanks for the same purposes at a probable investment of $215,000.

On the other hand, if the tanks are required for holding purposes or are already available, then the meter installation would have to be justified on the basis of reduced evaporation, improved accuracy, or better control.

Increased Accuracy Big Factor. Experience indicates that the significance of measurement accuracy is fre-

quently underestimated. Often meter installations will return the required investment on this basis alone. Reduced labor cost is a point of questionable advantage; labor saving is currently considered of minor significance in the justification of meters as a means of measurement.

A concrete example of the economics resulting from meter measurements is well illustrated by an installation recently made in North Louisiana. At a small gathering station where four streams terminated, six 55,000-barrel cone roof tanks were used for measurement purposes. One stream was measured for custody transfer while the other three were measured for checking purposes only. Bad pipe and extent of corrosive action on the tributaries into the station made volume checks at this location essential for leak control.

A meter installation to provide the same measurement function as the tanks was proposed and installed for approximately $20,000. An evaporation study indicated that the annual saving in oil loss will be about 27,000 barrels or roughly $80,000 per year. This indicates a payout period of six months after income taxes. In addition to the reduction in evaporation losses four of the six tanks were sold in place, the sale price being approximately the same as the investment required for the meter installation. Of course this is an unusual situation, but it emphasizes the value of the PD meter as a device to aid in loss control and should serve to remind us that in-line measurements offer many economic advantages.

Future Good. The future for PD meter measurements appears very good. Use of PD meters in connection with trunk line, gathering and tank truck operations has been satisfactorily demonstrated at several Interstate stations. The use of PD meters as a facility at marine terminals is a promising possibility, especially with the development of the 10,000 bph capacity nearing a reality.

The use of meters in connection with automatic lease custody transfer and other types of unattended operation where volume determinations are required, is attracting widespread industry attention. It should soon be one of the accepted methods of volume measurement.

ACKNOWLEDGMENT

Presented at the ASME Petroleum-Mechanical Engineering Conference, Dallas, Texas, September 23-26.

How You Can Make Your Operating Standards Pay

Responsibility for effective operating standards rests with the engineer. He must determine need for new standards . . . draw them up . . . keep them current . . . and retire them when no longer needed.

By A. A. HARDY, Chief Engineer, W. C. Norris, Manufacturer, Inc., Tulsa

PIPE LINE OPERATING standards are justified only when their ultimate effect is to *profit* their users. There are three ways in which a company standard can produce a profit . . .

- Providing improved availability.
- Improving service dependability.
- Lowering investment in parts stocked.

The above factors bring more cold cash into the till. The engineer's responsibility is to keep this fact in mind. In meeting his responsibility, the engineer must maintain efficient, up-to-date company standards. This can be accomplished in the following ways:

1. Recognize and explore the neces-

Engineers can maintain effective operating standards by following these four rules:

1. ***Determine necessity for standards:***
   - **Are they repetitive?**
   - **Are they premature?**
   - **Are there applicable external standards existing already?**
   - **Will they lower costs?**
   - **Will they improve operations?**
2. ***Write up standards:***
   - **Maintain simplicity**
   - **Spell out where they will apply**
   - **Consult management and other departments**
3. ***Keep standards up to date with new developments in:***
   - **Materials and equipment**
   - **Methods**
   - **Company policies**
4. ***Retire standards when they:***
   - **Conflict with others**
   - **Become obsolete**
   - **No longer affect economy of an operation**

sity and advisability of developing new standards.

2. Formulate standards with others, both in and out of the company, so they will be workable and of value as applied to the company's particular operation.

3. Keep the standards up-to-date—keep abreast of improvements and research.

4. Kill the standards when their usefulness expires.

In determining the need for a standard, the engineer should make certain that the need is a repetitive one and will effect a definite economy. If the problem occurs only once or twice, a standard set as its solution ends up a useless one—a problem in itself.

Nor should a standard be set too quickly with respect to a new piece of equipment. Such items should have their trial periods first, to prove operating acceptance, design effectiveness, feasibility and economy.

Consider the API standard on pipe line valves for instance. It was first issued in 1935 although valves had been used for many years previous to that time. Had a standard been formulated a few years earlier, we might have been saddled with an inadequate set of design specifications which could have cost the industry many millions of dollars.

If standards are already set, avoid duplication. Even for products which have been produced by a company for years, the adoption of a standard may be neither economical nor advisable. A standard should be formulated for a product only when one is deemed necessary. Where an existing external standard applies and is adequate, a new one is obviously not needed.

When the need for an engineering standard has been determined and the decision to formulate it has been made, it is the engineer's second responsibility to lay the framework and to make the first draft. In most cases he can find a model, an external standard, a government specification, or a national or industrial standard already set up, upon which he can base his work. Care should then be taken to cull parts which do not apply to the particular operation of his company and add others which would control it more economically.

Make use of existing guides. There are many rules and guides to which the engineer must pay heed in formulating new standards, chief among which are the improvement of quality and the lowering of costs. Here, the engineer's technical knowledge and training are needed to evaluate and simplify the mass of data which is usually available. In selecting sizes of stock, ratings and sizes of products, and a great many other similar problems, the use of preferred numbers as explained in A.S.A. Z17.1, "American Standard Preferred Numbers," can be valuable.

Scientific "know-how" can simplify standards. Knowledge of metallurgy is also invaluable in standardizing metal stocks. There are something like 2000 types and makes of tool and die steels. One company in the metal processing field reports it was stocking 60 different grades of such tool steels, each apparently different in cost, technical description, heat treating properties or other characteristics. They were analyzed metallurgically and it was discovered that there were no more than 12 positive types. Cost and production records showed that only two types were needed to give reliable and economical service.

Management policies and economics play a part, too. In formulating these company standards, the engineer's responsibilties do not end with the technical aspects which lie in his field. He must consult management where policy and economics are concerned; the purchasing department where availability, price quantity discounts and possible premiums are concerned; the warehouse and materials department where they might well be affected; inspectors, for it is their job to measure and test in accordance with the standards; and last but not least, the operating department, for they are the ones who must live with it. In short, developing and maintaining a standard requires close cooperation and consideration by practically all departments of the pipe line company.

Keep standards up to date. The engineer's third responsibility lies in maintaining company standards; and they do need maintaining. Increasing knowledge and experience, new developments and improved methods all require that an active standard should be periodically revised. The API standard on line pipe is in its fourteenth edition with many supplementary revisions. In like manner, the value of company standards will materially depend upon constant revision as improved methods, better designs and newer and superior materials are uncovered. A standard should never be a refuge for frozen tradition nor a brick wall to exclude new and better ideas.

When it is no longer useful—kill it. Finally, it is the engineer's responsibility to completely close out those standards which have outlived their usefulness. A standard which has been unsullied by revisions for a period of years should bring suspicion that it might better be relegated to the wastebasket.

Procedural standards need attention, too. Most references have been to material and dimensional standards. Of equal importance to the engineer, are those standards covering procedures such as those in the engineering departments. Certainly drafting symbols and convention should be standardized within the company so that no question will arise in the shop as to interpretation. These symbols and conventions should also agree with those most accepted nationally, as well.

Standards of design such as working stresses for various materials and standard formulae and graphs for often repeated calculations should be set and adopted. The DuPont Company for instance, after installing standards on design and drafting, found that in the year ending Nov. 1, 1947, a saving of $91,000 had been effected in the design division alone. Standard procedures in testing so that test results may be interpreted on a common basis are highly important, economically.

The responsibilities of the engineer in developing company standards are manifold; they extend beyond the theoretical to many non-technical fields and into the realms of horse sense. Suffice it to say they begin with the birth and end with the demise of such standards. —**The End**

FIGURE 1—Ditch-padder sifts rocky spoil bank at left to dump finer dirt on pipe line. A simple pin attachment ties machine to standard side-boom tractors, and permits easy release for use of tractor on non-padding operations. Doors shown on bottom of conveyor tube enable operator to distribute padding material at a variable distance from point of pickup. A later development employs a conveyor belt to catch the dirt from the conveyor tube and deposit it six or eight feet in front of the padder.

Sifting Backfill for Profit

New machine cuts padding costs up to 80 percent by eliminating need for rock shield and hauling fill dirt in by truck. Another design in test stages.

By RICHARD J. TITUS
PIPE LINE INDUSTRY Staff

RECENT DEVELOPMENTS in pipe line padding procedures have gone a long way toward solving the problem of providing low cost protection to pipe lines in rocky terrain. Early in the 1956 construction season a new machine was introduced that picks up and sifts padding material from the spoil bank. This machine supplies a generally accepted padding material without the high costs of hauling it in by truck.

Protective padding has been necessary on a large amount of this year's construction. Until the advent of these machines, it was necessary to haul in the padding material from a burrow pit either by dump trucks or scrapers. In some areas, hauling distances stretched to several miles, making the cost of dirt padding too high. There was also the possibility that material hauled in might contain hidden rocks which could damage the

FIGURE 2—Revolving steel drum at right cuts through the spoil bank, throwing aside rocks too large to pass through its grid. After padding is complete, equipment can be brought in to push these rocks into ditch as backfill.

pipe coating and defeat the whole purpose of padding.

Dirt will still have to be hauled in for lines cutting through solid rock, but, where there is enough soil with the rock to be sifted out, this machine can cut padding costs as much as 80 percent. Several contractors' spreads have been proving the economy of the machine during the past six months.

First Padder Replaced 15 Trucks. River Construction Corporation used the padder on construction of a 150-mile 18-inch crude line for Sinclair Pipe Line Company between Jacksboro and Teague, Texas. Until the padding machine was placed in operation, River kept a fleet of dump trucks, as many as 15 at one time, busy hauling the dirt for padding material. The padder eliminated the need for this. On that particular job, the padding was already in the bottom of the ditch and the pipe had already been lowered in when the padder was called upon to do the covering.

Progress on this job averaged about 3000 feet per day. This could have been increased 100 percent if those rocks which were too large for the padder had been placed to the outside of the spoil bank by the backhoe operator who cleaned the ditch.

Actual Cost Figures Not Available. No actual cost figures are available from the various contractors using the machine. Cost estimates vary from under 10 cents per foot on small pipe sizes to 20 cents per foot on big-inch pipe. This figure includes machine rental charges plus a side-boom and labor costs. This compares to costs as high as 60 to 70 cents per foot for hauling in backfill and applying rock shield.

In addition to this direct saving in construction costs, there is the long range saving realized from better coating performance.

Padding May Affect Flow Efficiency. An interesting but unexpected experience was reported by an Iraq pipe line operator. Field men found that where they did not make sure to place fine padding next to the buried pipe line, flow efficiencies were actually affected. Loose rock allowed rain water to seep in next to the pipe line and flow as a stream along the pipe. This dropped the temperature of the oil in the pipe, increasing its viscosity, and lowering the flow rate and line efficiency appreciably.

How Rotary Drum Sifter Works. The new machine sifts dirt from the spoil bank and deposits it in the ditch in one operation. Its basic components are a rotary sifting drum and an auger conveyor. The drum is made from steel rings spaced about two inches apart, which, with cross pieces, form the grid through which the fine material is separated from the rocks. The exterior of the drum is equipped with blades and teeth.

When the drum is rotated and moves into the spoil bank, the fines and rocks are picked up and passed over the drum. Fines fall into a hopper in the center of the drum and the rocks are passed on over and down behind the drum. The auger conveyor moves the fines down a tube to an opening over the ditch.

New Development Prevents Damage. Fines fall from the opening in the tube onto a belt conveyor

The padder has been used successfully on these jobs . . .

Pipe Line	*Size*	*Contractor*	*Average Daily Progress*
Sinclair Pipe Line Co.	18 Inch	River Construction Corp.	3000-3500 ft.
Pacific Northwest Pipeline Corp.	6 Inch	H. B. Zachry Co.	6000-7000 ft.
El Paso Natural Gas Co.	34 Inch	Western Pipe Line Constructors Co.	2000-2500 ft.
El Paso Natural Gas Co.	20 Inch	Western Pipe Line Constructors Co.	3000-3500 ft.
Pacific Northwest Pipeline Corp.	26 Inch	G. G. Griffis, Inc.	2500-3000 ft.
Colorado Interstate Gas Co.	22 Inch	R. H. Fulton & Co.	2500-3000 ft.

Apparently, the daily progress is about inversely proportional to size of pipe being padded.

which drops the fine dirt on the pipe some 6 or 8 feet ahead of the ditch padder. This padding in advance of the machine provides a safety covering for the pipe in case a rock is knocked from the bank into the ditch by the rotating drum. This conveyor belt is a modification of an original design which dropped the dirt onto the pipe directly from the auger conveyor tube.

The padder is powered with an engine employing a torque convertor, which is mounted along with the drum and the auger conveyor on a 6-inch I-beam frame. The frame is pinned and hinged to a standard sideboom tractor, requiring only the addition of a small adapter plate to the base of the boom. It can be attached or detached from a tractor in a few minutes, permitting the tractor to be used for other purposes when ditch padding is not required.

This mounting also permits the operation to be carried on from the working side of the right-of-way which has already been graded.

The sifting drum can be raised or lowered in the spoil bank by the tractor operator through the use of the winch line on the sideboom or by use of a hydraulic cylinder on the ditch padder. Padder controls are fitted on the tractor. This makes it possible to raise the drum over big boulders in the spoil bank eliminating the necessity of stopping and moving them. Furthermore, this up-and-down adjustment permits handling only as much material as is necessary to pad the pipe adequately with fine dirt.

New Padder Tested. Another padding machine undergoing initial field tests is designed to pad and backfill in one operation. This machine is not an attachment, but a separate machine in itself. Actually it is a modified ladder-type ditcher and, in effect, reverses the ditching operation.

Preliminary estimates of the cost of this machine run to about $45,000. Its designers state, however, that, in eliminating the time and labor that went with hauling in fill material by truck, dumping it, and then 'dozing the heavy fill in on top, the machine could pay for itself in the first 100 miles of padding and backfilling.

A prototype model of the padder is currently being tested on El Paso Natural Gas Company's looping job in Arizona. It was used for part of El Paso's 80-mile 34-inch line and is now being tested on a 20-inch line in the same locale.

FIGURE 3—Another design, still in experimental stage, is being tested by another manufacturer on the El Paso Natural line in Arizona. It is an adaptation of a ladder-type ditcher that reverses the ditching process to scoop up backfill, sift it and dump it on the pipe. The fines are deposited first and the larger particles dumped further aft where the padding is already down.

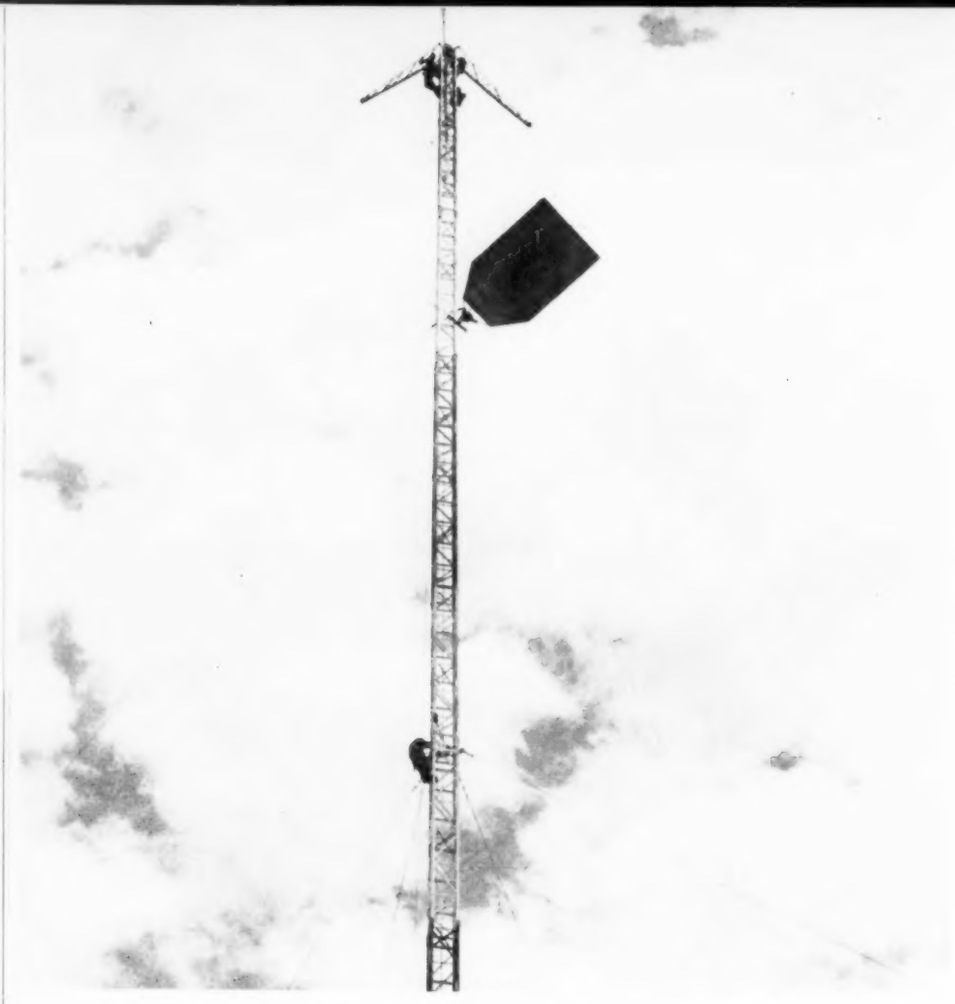
This design employs two series of shovel-buckets, operating side-by-side, which ram into and pick up the spoil bank. When the buckets reach the top of their cycle, the fill material is dumped onto a conveyor belt just below. Actually there are two conveyor belts, one operating below the other. The upper belt has links which are steel grids with two-inch spacing. Vibration in this belt causes the smaller particles of dirt to drop through onto the lower belt which deposits the fines directly on the pipe. The materials remaining on the upper conveyor are routed to fall on pipe that has already been padded with the finer materials. The two series of buckets are offset to insure an uninterrupted flow of padding onto the pipe.

Large paddle wheels just to the outside of the buckets are designed to push outlying fill material into the path of the buckets. Boulders and formations too large for the buckets must be moved beforehand or the padding machine must be routed around them. The machine is designed to handle spoil bank at the same rate as the ditcher did in excavating.

Padder Accomplishments. Surer protection to pipe line coating at less cost. In the nine months since the first padding machine was introduced, actual field applications have proven the economic advantage of the new machines over conventional padding methods where rocky terrain once meant high costs. Crossing rocky terrain is still an expensive operation, but pipe-liners now can save up to 80 percent of padding costs and be a lot more certain of the effectiveness of their pipe line coating.

ACKNOWLEDGMENT

This article based on field reports supplied by Sam Lewis, chief engineer, M. J. Crose Manufacturing Company, Inc., Tulsa, and by Jim Cummings of Crutcher-Rolfs-Cummings, Inc., Houston.



A Microwave reflector is hoisted into place atop the 280-foot tower at Service Pipe Line Company's Binger, Okla., repeater station.

More direct and reliable communication with . . .

Service's Sooner Microwave

System permits remote control of El Reno station in Oklahoma from Monroe, Texas. Similar system planned for main line in Missouri.

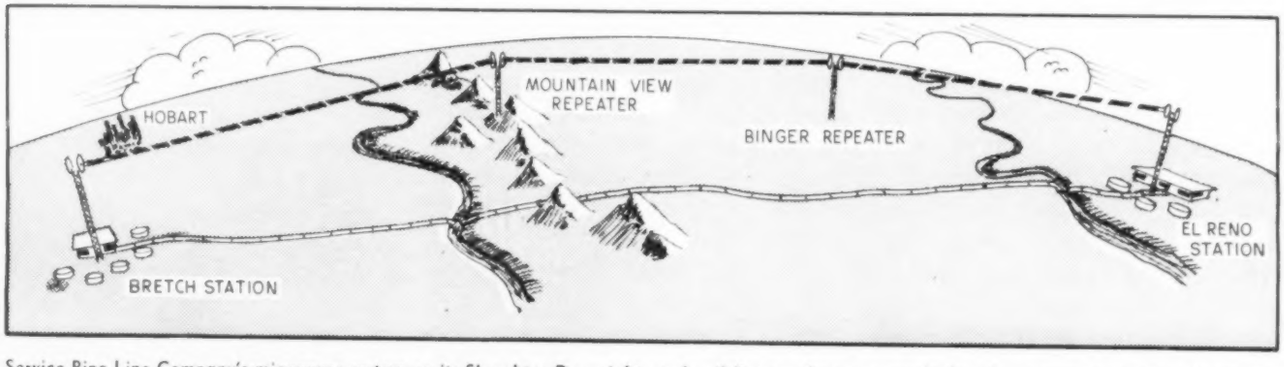
By BILL BROCK
Service Pipe Line Company
Tulsa

IN ELIMINATING 121 miles of land-line telephone system, this first of two new microwave systems is supplying Service Pipe Line Company with a more direct and reliable communication system. Operations began in July, 1956, and cover a 79-mile stretch between El Reno station and Bretch station, both in Oklahoma, on the Slaughter-Drumright crude oil pipe line.

This installation marks the first use by a pipe line company of newly designed microwave radio-frequency system. The system transmits and receives radio frequencies in the 6700 megacycle band, assigned by FCC for petroleum use. A klystron tube generates this signal.

With Service's microwave system, El Reno station can be operated from Monroe station in Texas. Information such as barrels per hour being pumped, discharge pressure, suction pressure, and pump case pressure is sent continuously and instantly to Monroe. This was previously impossible because of the length and interconnection of the land-line system. Controlling is done through one channel set aside for remote control and telemetering. Nine electrically operated valves including the headgate at each station along the pipe line can be activated by the microwave, either automatically in event of an emergency, or as desired by the engineer at Monroe. Local sequence takes over after the control has been initiated. Monroe is connected to the Bretch terminal microwave station by land lines.

This system also improves other



Service Pipe Line Company's microwave system on its Slaughter-Drumright crude oil line employs two terminal and two repeater stations in sending signals over the 79 mile route. The new system replaces 121 miles of land-line telephone system.

Service's microwave equipment, designed for radiotelephony, radiotelegraph, facsimile and audio tones and impulses, was tested in Dallas. Shown left to right are Gus Lewis and Francis Murphy of Service.

The base of the tower is fastened to its concrete foundation by four ¾-inch anchor bolts. The copper covering over the concrete base serves as a grounding element.

pipe line operations. It fills a gap in the communications system from the general offices in Tulsa along the Slaughter-Drumright line to West Texas.

Survey Precedes Construction. Equipment manufacturer's personnel, assisted by Service engineers in the Oklahoma Division and on the Tulsa office staff, completed preliminary survey of the area to be covered in December, 1955. The survey revealed that 200-, 240-, 260-, and 280-foot towers would be needed at the terminals and repeaters to obtain the line-of-sight path required for the microwave radio "beam." On April 23, 1956, the Federal Communications Commission granted permission to proceed with the installation.

The four towers were located in four counties in western Oklahoma. The western-most tower is at Bretch, a terminal station located 2½ miles north of Roosevelt, Okla., in Kiowa County.

The second tower, 27½ miles to the northeast, is at Mountain View, 6½ miles northeast of the town in Washita County. The third tower is 27½ miles to the northeast at Binger, Caddo County. The final terminal station is at Service's El Reno pump station, four miles east of town in Canadian County.

The Bretch and El Reno installations are terminal stations, whereas the Mountain View and Binger installations are repeater stations.

About three acres of land were purchased near Binger, and about 3½ acres were leased near Mountain View. Since these are repeater stations, sufficient land was needed to construct small buildings to house microwave repeater equipment. Equipment at the terminal stations, at El Reno and Bretch, is housed in the pump station.

Tower a Day. The actual erection of the towers was a fast-moving operation, usually taking a single day for each tower after the concrete bases and anchors were installed. The towers were designed and prefabricated in advance to speed erection.

Construction of the towers began with the placing of a concrete base, which tapers to a two-foot square area at the top with a copper cover where the base of the tower rests. The entire weight of the tower, some 9000 pounds for the 280-foot structure, in addition to the weight of two torque arms, two reflectors, and 4000 feet of guy wires, is centered in a small area in the middle of the base. It is secured by four ¾-inch anchor bolts.

The towers were transported to the building site in 20-foot sections by truck. Fourteen of these sections, made of galvanized steel, make up the 280-foot tower. They are painted orange and white and stand in 40-foot lengths of each color when the tower is assembled. These colors are specified by the Civil Aeronautics Administration to give warning to pilots of low-flying aircraft.

Necessary equipment for raising a tower is on the transporting truck. The first two sections of the tower are bolted together on the ground and raised into place. Once they are secured to the base, the remaining 20-foot sections are hoisted into place by a specially designed 45-foot, four-inch steel pipe with a pulley at the top. This hoist is attached to the uppermost installed section, and is used to lift the subsequent section to its position. In all, about six men were used to raise a complete tower.

Each section of the tower is two feet square, with all-welded fabrications, and weighs approximately 600 pounds. The sections are secured to each other by five bolts on each cor-

ner. Rigidly built, the towers will withstand winds up to 150 miles per hour.

Wires Limit Tower Twist and Sway. Guy wires hold the towers rigidly in place. Four-thousand feet of seven-strand, one-half inch steel rope is used to anchor a single 280-foot tower. Four sets of guy wires are used for each tower. The first set is attached to the 60-foot level, the second to the 140-foot level, the third at 220 feet and the fourth set is attached to the two torque arms at the top of the tower.

On the ground, the guy wires are anchored to concrete "deadmen," buried six feet in the ground. The "deadmen" are situated 90-degrees apart in circles ranging 112 to 225 feet from the base of the tower.

These anchoring wires will hold the tower to less than one degree of twist and one inch of sway in a 100 mile-per-hour wind. Two 23-foot torque arms at the top, to which the last set of guy wires is attached, help keep the tower and reflectors from twisting.

How Reflectors Work. The erection of a tower is completed when reflectors are attached to its top. Made of flat aluminum sheets, the reflectors look like giant fly swatters. They are 8 feet wide and 12 feet long. The repeater stations, at Mountain View and Binger, each have two reflectors. One reflector is installed at each of the two terminal stations.

These reflectors pick up the microwave beam and "reflect" it on its way, much as a mirror picks up and reflects sunlight. They are attached to the top of the towers at a 45-degree angle. Their purpose is to pick up beams, and slant them down to "dish" receivers at the base of the towers.

The "dish" is a bowl-shaped microwave receiving and transmitting component. It is made of spun aluminum, and is located either at the base of the tower or on the roof of the nearby equipment house. The "dish" picks up the reflected microwave so it can be amplified and sent out to the next station via the second reflector at the top of the tower.

To Use Five Channels. When Service's towers were completed, transmitting and receiving equipment was installed and tested by the Collins Radio Company. The FCC authorized the system to use radiotelephony,

Sections of Service Pipe Line Company's 280-foot microwave tower at Binger are hoisted into position by a 45-foot, 4-inch steel pipe with a hoist at its end. The hoist is attached to the uppermost section, and moved upward each time another section is bolted in place. Power for the hoist is supplied by a winch-equipped truck.

radioteletype, facsimile and audio tones and impulses for signaling, telemetering and supervisory control.

Five channels are equipped for use. The first is a voice channel connecting the existing oil movement circuit between Tulsa and the West Texas oil traffic engineer. The second channel is a party line for oil dispatching. The third channel is for telemetering and remote control. The fourth channel is set up for automatic microwave fault-reporting, and the fifth is a voice service channel for use by microwave maintenance personnel. The entire system is capable of being expanded to provide over 100 voice channels.

Mechanical filters are used to separate the channels. The radio signal that is received at a terminal station is converted to an intermediate "video" frequency, which contains signals for all multiplex channels. This is fed into the equipment that contains the mechanical filters. The mechanical filter then selects the individual channel frequency carrier and passes it on into the channel demodulator. Each channel is selected by similar means to bring out other channels into their respective demodulators.

When a signal is transmitted, the above process is reversed, except that separate sub-carrier oscillators are used. Each channel is fed into a modulator unit, which amplitude modulates the channel frequency generator. Then all channel frequency generators are tied together at their output and a composite "video" signal is used to modulate the klystron transmitter.

Both amplitude modulation and frequency modulation are used in the microwave system. The amplitude modulation signal voltage when applied to the klystron repeller causes the microwave output signal to be a FM type radio signal.

Terminals Have Emergency Power. At the terminal stations, the equipment is powered by the source feeding Service's electrical motors which drive crude oil pumps. At the repeater stations, power is supplied by REA facilities. Normally operating on 120-volt, single-phase, alternating current, the repeater stations are also equipped with an emergency power supply. In case of a failure in the REA power supply, emergency batteries have been installed at these stations. These batteries will operate the repeater stations for periods up to 12 hours, providing a stop-gap until normal power can be restored.

System Planned for Missouri. Service's second system, scheduled to go under construction late this year, will be located on Service's main line in Missouri, between Freeman and La Plata. This system will span 158 miles and will provide Service with the means for centralized monitoring of Missouri pump stations and remote control of Mayview and Rothville stations. The system will be completed in the early part of 1957. It will have ten channels installed.

The control point will be at Freeman station, Missouri. The system will also provide intercommunication, in conjunction with telephone lines, between the general offices in Tulsa and points in Illinois, as well as with the Missouri's pump stations themselves.

Both the Oklahoma and Missouri systems will serve to improve the over-all operation of Service's system. Service formerly depended on a 5000-mile land line system, which carried both telephone and teletype signals as well as telemetering in some areas.

Goal of the new microwave system —a shorter and more reliable communications system in these operating areas.

—The End

Are You a Retirement Addict?

The American public is going overboard about retirement, say two prominent psychologists. In some respects the fad is bad . . .

By **ALLAN J. FLEMING and C. A. D'ALONZO**
E. I. du Pont de Nemours and Company
Wilmington, Delaware

THE RETIREMENT fad is here! More and more people are living to be 65 years of age, and more and more people 65 years of age are retiring.

Many healthy individuals are not waiting for 65, but are jumping aboard the bandwagon sooner. With this trend, a new era of civilization is upon us. Retirement motels, hotels, villages, and towns are springing everywhere. You can work your way through, or pay for it. You can wait on tables, or be waited upon.

Day-time television—to entertain the infantile, puerile, or the senile.

Accompanying this swing is a deluge of pills to help you enjoy old age, mentally and physically, pills that make you sleepy, but not drowsy; food that will give you the feeling of satisfaction of having eaten a big meal, but which do not add calories; lotions to make your skin soft and younger looking but which are said not to cause dermatitis; cathartics which give you effective purging, but which are claimed to be non-irritating. "X" mixtures are available in toothpastes, hair tonics, gland creams, and geriatric pills. There are specially designed chairs that permit you to sit, lie, or stand, without any muscular effort on your part. Day-time television programs are here to entertain the infantile, puerile, or the senile.

Just in case you run a little short of change, you can raise mushrooms or chinchillas in your cellar, grow orchids in your kitchen, or bats in your belfry. If you are still having difficulty, you might want to consider moving to some other country where living is cheap, and it is possible to pay for one or two servants with your social security check.

We are trying to make retirement so attractive that an entire new philosophy has developed of it. Thus, one 20-year older took one look at the pension and retirement benefits of a large company and said, "Man, I can't wait." This is in line with the philosophy that old age begins at birth. We next expect some third dimensional therapeutic agent to appear which will speed the age process so that we can reach 65 years sooner.

Employment is now considered to be something one has to sweat through until the lovely years of retirement are reached. Booklets are available which tell you, in a few minutes, how to prepare for this wonderful reawakening. These inform you how to cultivate your thinking so that you will be prepared for the time when you no longer are required to think.

Forgotten in the retirement craze is the unretiring wife. For the first time she has good old "do it yourself" Albert hanging around the house twenty-four hours a day. If he has never done anything useful around the place during his active years, he will undoubtedly perform equally well during retirement. The meals, the shopping, the housecleaning go on as usual while Albert plans the politi-

Retirement motels, hotels, villages, and towns are springing up everywhere.

cal downfall of the other party, spills ashes on the carpet, operates the "Hi Fi" set at a 120 decibel level, and writes letters to the editor.

During the early thirties the joys of retirement were delightfully illustrated with pictures of a robust, healthy middle aged man sitting in a boat fishing as his less middle-aged wife pulled on the oars—and all this pleasure with a guaranteed monthly income of $50.

Today we are amazed to see pictures of the same couple, still youthful and robust, and still trying to catch a fish. However, two wars and 20 years of the New Deal has increased the need of the monthly income to $250.

One would suppose that by this time the husband would have become discouraged by the lack of fish, and the wife mighty tired of rowing—but alas, that's retirement for you!

The pleasure, mental fulfillment, and enjoyment, the accompanying satisfaction after a day's work, well-done, appears to be overlooked. We should realize that the happy, contented worker is likely to develop his skills, pleasures, attitudes, and family enjoyments, so that the process of preparation for retirement occurs slowly and deeply, over a life time, with gradual but firm physical, spiritual, and mental metamorphosis. More often these pleasures, or hobbies, will probably be related to the same skills and knowledge to which one has previously been employed, and particularly which one has enjoyed over a life time, rather than frustratingly performed over a life time just waiting for age 65.

One cannot talk of retirement without bringing up the related subject of hobbies, the next great national trend. The development of a hobby is thought by some to be paramount for the preparation of retirement.

Modern "authorities" seem to have lost track of the possibility that a man's work might be a hobby. The present trend is to view a man's position or job as something that is nerve-wracking, produces coronary thrombosis, breaks up families, and makes one feel quite miserable and always eager to escape. In other words, the present concept of a man's work all seems directed into the belief that all jobs are a short cut to the nearest insane asylum. When a person wishes for his working day to end so he can get to his hobby which he enjoys, then his life is mixed up and needs readjusting. That person had better start to make his hobby his vocation.

The next great national trend—the hobby.

Webster defines a hobby as "an engrossing topic, plan, etc., to which one constantly reverts; also, an occupation or interest to which one gives his spare time." It is plain that even the definition admits that an occupation might possibly be a hobby, even though it does not permit you to do what you like full time. The idea of the vocational hobby seems lost in the modern trend. An engrossing topic or plan to which one often reverts might also be identified with loafing. Might not loafing be a hobby for some? There is also a little flaw in the definition referring to spare time, because the playboy might have 24 hours spare time, whereas a working man might have very few hours spare time. We submit that the definition might be broadened to include an occupation, the interest to which one gives his full as well as his spare time, but which he enjoys. A hobby might be beneficial or detrimental, profitable or profitless. A happy vacation is a good example of a desirable hobby.

Too often the very people for whom hobbies are recommended, by professional as well as non-professional advisors, already have one which is not recognized as such. Drinking might be considered a hobby for some, and is a good example of one which might be desirable or undesirable. Overworking could be a hobby for others, but we are reaching the point where it is considered disrespectful to overwork.

We are not opposed to hobbies as such. Our disagreement is with the widely disseminated and generally accepted view that to be happy one requires a hobby. This concept is erroneous. A lot of happy workers do not require a hobby, and in retire-

ment one need not be developed, often it is there. It may not be recognized or defined as a hobby, but its function is the same. Moreover, it is still possible for a person to enjoy his job sufficiently whether it be clerking or garbage collecting, so that he does not mentally require, for happiness, any other hobby.

One's job must be dull and incompatible if a day is wasted, waiting for it to end. Golf, matchbox collecting, and others are still not necessary for happiness. It is conceivable that a man can like his job, regardless of what it might be, to the extent that when his day's work is done, he contentedly looks back on the day with pride, and he views with happiness, not alarm, the next day. Moreover, it is again possible for one to be sufficiently content and engrossed with his work that he puts ten to fourteen hours a day in it. The poor soul is to be pitied who has to find something else after eight hours of work to create happiness for himself because he only has to face his dreary job again at 8 o'clock the next morning. Don't pity the plugger who takes his work home with him at night, or who works long hours into the night. Pity the man who, at 5 p.m., gets a sentence of freedom only until 8 a.m. the next morning.

There are those who believe that when a person to be pensioned does not have a hobby which is detectable as such, his chances of acquiring a beneficial one are slim. Hobbies might be like talent, you either have it or you "ain't" got it. If you have it, it is most likely something from which you might even be deriving your livelihood. Unrecognized hobbies are common.

The idea of older people looking for new hobbies does not impress us. Take the case of a physician, lawyer, or dentist who has spent the greatest part of his life training and acquiring more and more knowledge and skill in his profession, and is expected only to end up at 65 plus years of age and drop it all because some well wisher advises him to seek a hobby.

If he enjoyed his life work, retirement could mean tapering off, reducing the load, exploring some small particular phase of his vocation, which until now, time has not permitted, or perhaps a part-time teaching assignment. If this is not possible, it seems reasonable that he should have changed his profession years ago. To suggest to a competent craftsman at age 65 that he start collecting stamps is wasteful, and, in our opinion, poorly given advice. How much better that person would be to channel his training into some special field of his life's experience.

Pity the man who, at 5 p.m., gets a sentence of freedom only until 8 a.m. the next morning.

It is psychologically reasonable that, in retirement, and the so-called need to develop a hobby, one's chief concern is the fear of oncoming death itself. The hobby is just the sleight of hand to keep your mind off the fact that after 60, 70 arrives. And as one gets older, death gets closer.

Preparation for old age should be to teach against the fear of death. Death is not necessarily undesirable, prolonged, or painful. Religious training should aid in the preparation for, and belief in, life hereafter. Remember the clergyman who, dying of cancer, said that death was a privilege and not a curse.

Life must be dull and drab, hobbies or no hobbies, for those who let each day arrive simply to bring them closer and closer to death. The man with the peaceful, contented mind, and a Christian attitude, without fear or thought of death, is the happy contented individual, with or without a hobby, and more often the one who lives the longest.

One cannot fear death without fearing life. And if you fear life, you are pathetic.

Our ideas of retirement, hobbies, life, and death need a complete rejuvenation. **The End**

About the Authors

Fleming D'Alonzo

ALLAN J. FLEMING, medical director for Du Pont, has been engaged in industrial medicine since 1935. A native of Canada and a graduate of the medical school at Montreal's McGill University, he started as a plant physician with Canadian Industries, Ltd., in Quebec, and later joined Du Pont as a toxicologist in its laboratory for toxicology and industrial medicine. The laboratory is devoted to research on potential hazards associated with Du Pont processes and products. In 1941, he was made assistant director of the laboratory, and in 1948 was appointed assistant director of the Medical division. He became director in 1954.

C. A. D'ALONZO, assistant medical director for Du Pont Company, has been engaged in the company's preventative-medicine program for employes since 1939. He joined Du Pont that year as supervisor of the medical unit at the experimental station near Wilmington, Del. Dr. D'Alonzo is a graduate of the University of Virginia, where he also completed his medical education. With Dr. Fleming, he is co-editor of a book on modern occupational medicine published in 1954.

During pipe line operations such as backfilling, tractors will be turned in one direction much more frequently than the other. This demands close attention to adjustment and servicing of steering brakes.

Care of Construction Machinery Pays Big

Here is a collection of maintenance ideas to help you get top performance from tractors and field equipment even under the worst weather conditions. These ideas will be particularly useful for late fall and winter work.

By J. J. KEYES
Caterpillar Tractor Company,
Peoria, Ill.

Although the article was written primarily for the guidance of operators using one make of tractors, the ideas expressed on the operation and care of machinery are of general interest to users of many makes and types of construction equipment.

TODAY'S PIPE LINE construction machinery is built to perform well under tough field conditions. And it will do it with a minimum of maintenance, but there are a lot of operating tips that will give better service and longer life.

Any well planned maintenance program should include:

- A maintenance schedule set up especially for the particular operating conditions. For instance, muddy terrain or severity of the job may dictate increased lubrication service. Other conditions may permit longer periods between checks.

- A definite schedule drawn up for making adjustments on items such as power control units, clutches, brakes, etc., and for checking leaks in water, fuel, and oil systems.

- An operating procedure for get-

Mud is the natural enemy of track type equipment. Watch adjustment of track tension particularly close while working in this type of terrain. Remove as much packed mud as possible from track components before parking if freezing weather is expected.

Dividends

ting the most production from equipment. For example, it may be well to get increased production from running equipment at its optimum, even though repair costs might be greater. However, this can be carried too far. Individual job records will show which plan gets the greatest production with the least spent for repairs.

- Have plenty of large, easy-to-read lubrication charts.

Clean Mud From Tracks . . .

Mud and freezing winter temperatures are enemies of tracks and components. Frozen mud locks up rollers and packs inside the track. Before parking a tractor in freezing weather, move it around on solid, dry ground to dislodge as much mud as possible. It's not unusual for a machine to freeze to the ground. A helping "boost" to break it loose is often very damaging. One way to avoid this is to park the tractor on planks, logs or even brush to keep tracks up out of the mud.

Cleaning mud from the tracks before leaving the tractor is a good practice whether or not freezing temperatures are expected. Mud always has a tendency to pack into track components and tightens tracks beyond the normal adjustment. When operating in material which packs easily, it is better to operate with the tracks just a little loose.

Keep Tracks Loose. Track adjustment may be done by using a wrench or by grease gun if the tractor is equipped with a hydraulic track adjuster. Take it easy on that wrench and grease gun. Don't overtighten the tracks. Overtight tracks require greater horsepower from the engine to rotate the sprocket and, when operating in material which packs, the horsepower required becomes even greater. Overtight tracks can also cause severe heating of the pins and bushings. In fact, some have been known to become so hot that the heat treatment in the bushings is "drawn back" and the bushings are tempered. This possible loss of hardness would lead to rapid wearing of parts and early replacement.

Continued on Next Page

Adjustment Is Key to Sprocket Care . . .

Practically all of the wear on a tractor driving sprocket occurs on the tooth surface which contacts the track bushings. Tracks that are too tight, too loose or misaligned speed sprocket wear. Service life of sprockets may be greatly extended simply by making a few adjustments or a change in operating practice. Tractors engaged primarily in drawbar work exhibit sprocket wear on only one face of the teeth. Life of sprockets can be measurably extended by switching sprockets from side to side periodically. Sprockets, correctly installed on the hub and periodically checked for tightness, rarely show any sign of wear on the hub section.

Worn teeth may be restored to usable limits by overlays of weld, provided this service is not delayed. Or if worn to 3/16-inch or less, sprocket teeth may be built-up with "patch plates" of steel.

To Get Maximum Life from Torque Converters . . .

Three basic components make up the torque converter:

- The impeller which is connected directly to the engine flywheel or through a clutch.
- The turbine which is connected to the output shaft (driven unit).
- The housing which supports the impeller and turbine, contains the oil reservoir and has blades to redirect the flow of oil through the turbine.

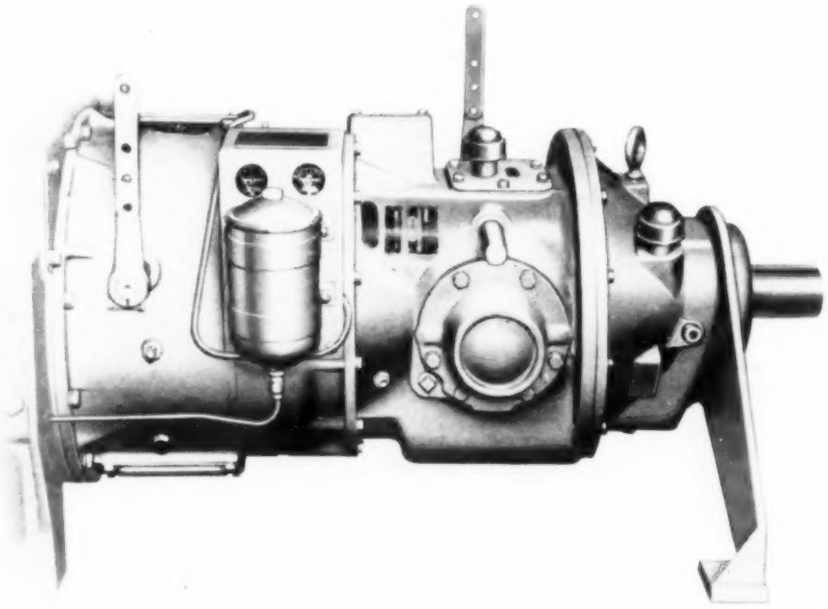
A torque converter, like most units producing torque, operates more efficiently through a certain range. Lower speeds produce more torque and therefore more work. However, stalling the converter or running it at extremely light loads produces excessive heat.

In either case, the heat generated by the rapid circulation of oil must be absorbed by the torque converter cooling system. The engine should never be allowed to operate at or near high idle speed with the torque converter input shaft coupled. Overheating will occur in a matter of minutes. Even with the engine operating at low idle speed and the torque converter coupled to the engine, overheating will also occur but after a much longer period of time. If the torque converter is equipped with a clutch it should always be disengaged when the engine is idled. If it is not equipped with a clutch experience will tell how long the engine may be safely idled before overheating will result.

Overheating can be prevented by observing the converter temperature gage and shifting gears or readjusting load or engine speed to operate within the recommended limits. For instance, it may be necessary to decrease the throttle setting while traveling in high gear.

To gain maximum life from the torque converter remember three points:

- Use clean fluid.
- Keep bearings lubricated.
- Operate the converter within its proper temperature range.



Torque converters will withstand rugged service but they do have limitations. Overheating, one common result of abuse, may be prevented by observing the recommended operating range. Shifting gears or readjusting load or engine speed often will correct the difficulty quickly.

Noise Can Mean Trouble. The torque converter normally operates very quietly. Unusual noise is an indication of trouble; such as foreign material in the torque converter or possibly a bearing failure on the input or output shafts. To prevent extensive damage, stop the converter immediately by stopping the engine or by releasing the clutch and then stopping the engine. Locate and correct the cause before attempting to operate the torque converter again.

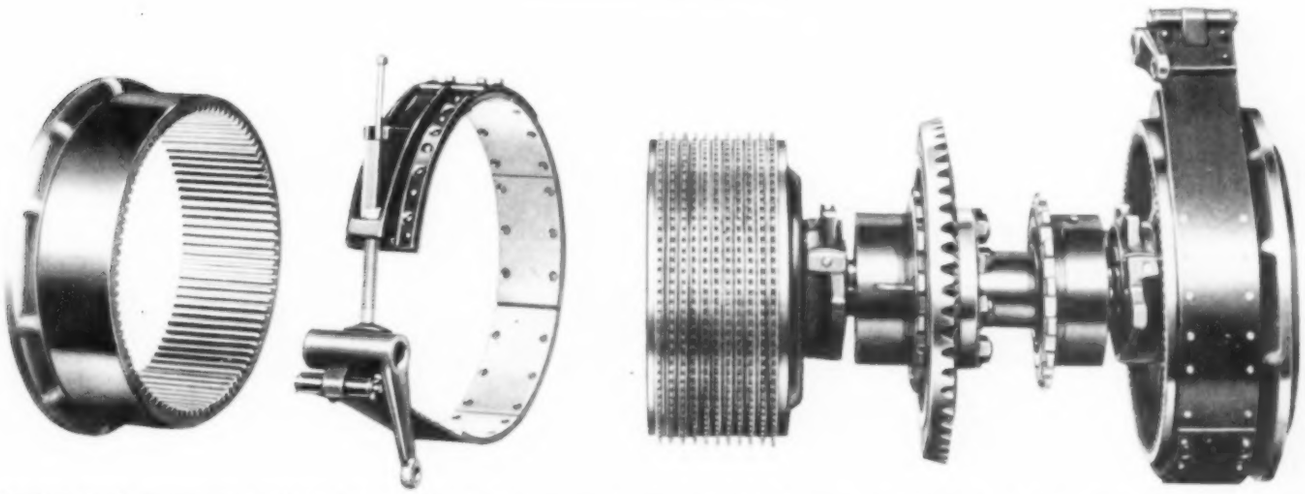
Lubricate Converter Regularly. All lubricant fittings on standard torque converters installed on tractors or engines require five shots of ball and roller lubricant from a lever type grease gun every ten hours of operation. Three fittings on tractor and clutch equipped engine torque converters convey lubricant to the two converter shaft bearings and to the clutch release bearing.

Each torque converter installation includes an orifice and an orifice strainer. The orifice continually bleeds a small amount of fuel, and any air from the highest point in the converter fluid system to the engine fuel filter housing. The fuel passing through the orifice supplies the diesel engine with fuel when operating a

low idle speed. After the first 60 hours of operation, and every 240 hours of operation thereafter, remove the strainer and wash it in kerosine or clean diesel fuel.

A separate filter is included in the torque converter fluid system to keep foreign material from entering the converter. The filter element should be replaced whenever the fuel pressure gage registers below the normal range with the engine running at rated engine speed.

Keep Drains Open. Two carbon-faced seals are used in the torque converter to seal the converter fluid from the bearings. When the torque converter is operating, a very small amount of fluid continuously passes the seals and drips out of drain tubes. Be sure these drain tubes do not become plugged: a small amount of drainage is normal. Should these drains be plugged, fluid may wash lubricant from the bearings and cause a bearing failure. When leakage is in excess of 10 to 12 drops per minute, seals are worn or damaged and need replacing.



Steering clutch components, including the steering brakes, are required to stop tons of equipment repeatedly. Periodic checks, adjustments and drainage of compartments will extend operating life.

Check and Adjust Steering Brakes . . .

Imagine your car equipped with an engine four times its present size, and having only one brake on the right rear wheel, which is fitted with lugs so that it cannot skid. Now let us visualize a 50-ton rolling load behind the car. How long do you suppose that one brake would last, even if the linings were ½ inch thick and 6 inches wide, acting on a 20-inch drum? One week, you say?—ten days? Perhaps, and yet the requirements of the tractor steering brakes are very much the same. Just as each steering clutch must be capable of transmitting the entire torque in the bevel gear shaft, so each brake must be able to provide an equivalent stopping force, often amplified by a trailed load downhill, this liberates tremendous horsepower in the form of heat energy.

Steering brakes in a track-type tractor are asked to perform this service many times each hour, day after day, often for months. Brakes deserve periodic checking and adjustment. The minimum requirements — periodic checks and adjustment—should never be neglected.

Other recommended maintenance operations assure better service and dependability. If steering clutch adjustment is delayed or neglected, the brakes carry unnecessary extra loads due to incompletely disengaged or dragging steering clutches.

Servicing Steering Brakes. In servicing steering brakes, the following suggestions, which apply in every case, should be kept in mind.

1. Brake adjustment should be checked at regular intervals. Fully release the steering clutch and depress the brake pedal. The tractor should turn correctly when the brake pedal is depressed the amount indicated in operating instructions. Don't overtighten the brakes. Free pedal movement is essential to a full and complete brake release.

2. The steering clutches and brakes are designed to operate in a dry state. Compartments should be drained at least once in every week of operation or every 60 hours by removing the plugs in the bottom of the case. An accumulation of oil or water can result in brake dragging as well as slipping and difficulty in steering the tractor. As a reminder, don't forget to replace these drain plugs. Dust and water getting in through the openings is harmful. If lubricant has been allowed to accumulate in the steering clutch compartments, the compartments can be washed out carefully.

3. Don't "ride" the brake pedals. While you may prefer these as foot rests, using the brake pedals as such is mighty expensive comfort.

4. A little oil applied periodically to the brake linkage joints lessens the force required to apply the brakes and also prevents brake drag by allowing the brake return spring to return the linkage to a disengaged position.

The brake band should be entirely free from the drum when the pedal is released. In order to maintain smooth operation of the brakes, care should be exercised to keep them properly adjusted at all times. Excessive loose-

ness developing in the brake mechanisms may cause kickback of the pedals during operation.

Certain types of operation, such as back-filling, involve frequent turning in only one direction and result in wear being confined almost wholly to one brake. This brake will need more attention and will need to be replaced more often.

Know Your Cooling System . . .

Is a house cooled more effectively by installing a fan in the window to pull cool air in, or by one which will blow the hot air out? In general, the blower fan as used in a tractor cooling system is slightly less efficient than a suction fan. This is due primarily to the fact that a suction fan draws the normally cooler outside air through and from all parts of the radiator core; the blower fan pulls the warmer air from over the engine and pushes it through an area of the core only slightly larger than the circular area described by the tips of the fan blades. Hence, with the same size radiator and same size fans, a suction fan will offer about 5° F. greater cooling ability than a blower fan.

In certain applications there are other more important considerations affecting the choice which often outweigh this small disadvantage. The radiator on torque converter equipped tractors must provide coolant for both the engine and the converter. It must dissipate considerably more heat than the radiator of a direct drive machine, so a blower fan is used here to avoid discomfort and dust for the operator during hot weather. Similarly, blower fans are used on tractors with bucket excavators to prevent bucket spillage from being sucked into the radiator.

Use of a blower fan is recommended in operations where a suction fan tends to collect leaves, chaff or loose dirt or where plugging of the radiator core is experienced. Where abrasive material is being handled, every precaution should be taken to prevent dirt from getting down behind the radiator, since the "sand blasting" effect of a blower fan on the radiator core is far more severe than that of a suction fan.

As weather conditions vary, many machine owners have both type fans available and change them twice a year. The suction fan is installed during cold weather months and then replaced with the blower fan in hot weather.

Installing Fans. Regardless of the type of fan selected, a word of warning is in order regarding its installation. On some models, it is possible to install the fan backwards on its hub; on others, there is little danger of this since lack of clearance would cause the fan blades to strike the radiator, making the error obvious before the installation could be completed.

Take a look at your fan. The blades are curved so that the air is pulled with the fan, regardless of whether it is a suction or a blower type. If it is assembled backwards, the convex blade surfaces will be toward the direction of rotation and air will just slide off the blade. Certainly, assembled in either direction, turbulence of the air can be felt; but if the fan is assembled backwards, its efficiency is reduced by approximately 40 percent.

Cold Facts on Hot Engines. Keeping the engine heat in balance, and within the optimum range for most efficient operation requires proper functioning of the engine's cooling system. Inefficient cooling in many instances is due simply to neglect. Years of experience show that cooling "problems" can often be overcome by applying one or more of the following suggestions as simple field corrections during engine reconditioning.

1. Examine the radiator fins. They must be clean and open for good circulation. Dirt and small stones may have peened the fins over, or oil spilled from hydraulic control units or surge tanks may have caused an accumulation of dirt.

2. Fan belt tension, although easy to adjust, is often overlooked. Belt slippage is dangerous. A certain amount can go unnoticed while reducing fan speed and air circulation through the radiator. On smaller machines it also reduces water pump circulation.

V-belts are designed to grip on their sides; they should never ride in the bottom of the pulley groove. In applications where more than one belt is used, belts must be of equal length in order to share the load equally. If a new belt is teamed with an old, stretched belt, the new belt will be overworked, regardless of adjustments. Therefore, matched belts should always be replaced in sets, and their adjustment checked at each service period.

Generally, the following rule can be observed when adjusting V-belt tension. V-belts used on adjustable pulleys or pulleys with an adjustable center distance are correctly adjusted when deflection is as follows:

Center Distance	Deflection
Up to 18 inches	$^{11}/_{16}$ inch
18 inches and over	$^{7}/_{8}$ inch

The above deflection dimensions are based on a 25-pound force applied perpendicular to the belt, midway between the pulleys.

3. There is no better way to invite trouble than by removing temperature regulators and discarding them. Should temperature regulators be suspected, they can easily be removed for testing their fully open temperatures with an accurate thermometer in a can of water. Most regulators begin to open around 170° F. and are fully open at 185° F.

4. Clean water and the use of a rust inhibitor prevents many cooling system problems. Water containing sand, dirt or large deposits of lime may cause plugging of the vent holes in temperature regulators or housings. This prevents the escape of air entrapped in the cooling system and lowers water pump efficiency. Abrasives in the water also cause premature seal wear and eventual leakage. Clear water and rust inhibitor not only prevent corrosion but also reduce the build-up of harmful, insulating mineral deposits around engine "hot spots."

5. Check for and eliminate any possibility of combustion gas leakage into the cooling system. Such gases will bubble out in the radiator top tank giving the appearance of boiling. The most probable causes are loose precombustion chambers, damaged

chamber seals or loose head stud nuts.

6. Stop water leaks and replace deteriorated hose connections, pressure relief valves and radiator caps.

7. "Overheating" may not exist. The temperature gage, being of necessity a fragile piece of equipment, can get out of adjustment, giving erroneous readings. If in doubt, use an accurate thermometer.

8. If a heavily loaded engine is suddenly shut down or stalled, steam forms in the hotter areas as water circulation stops, and sometimes forces water out of the overflow tube. This is easily mistaken for overheating. Avoid it by allowing an engine to idle for five minutes before stopping. If such "after-boil" should ever occur, be sure to refill the radiator, otherwise further operation may produce actual overheating.

Lubrication Tips . . .

In preparing to refill with fresh oil, any compartment should be drained when it is warm—it is best to drain after the engine has run for some time. Most of the sediment will then be in suspension, and will drain readily.

Lubricating oil used in the starting engine crankcase, fuel injection pump housing, diesel and starting engine air cleaners and some other compartments may be either detergent type or straight mineral crankcase lubricants, whichever is more economical.

Extreme care should be exercised when filling any compartment with oil to keep out dirt. All dirt should be carefully removed from the filler plug and the area around it, before removing, to insure against any dirt falling into the compartment.

For the diesel tractor, chassis lubricants, stringy, tacky, semi-liquids that are just fluid enough so they can be handled in the standard volume compressor at prevailing atmospheric temperatures, are recommended for the track rollers, track carrier rollers, track roller frame outer bearings and idlers. Under no circumstances should the track be lubricated. The stiffness noted in a new track is not caused by a lack of clearance between the track pins and bushings and will disappear as the tracks wear in.

Filter Element Requirements. Facts about filter elements are often confused. There are four definite requirements of any element:

- The element must remove dirt, abrasives and sludge from the circulating oil.
- It must permit the required flow of oil.
- It must function effectively in the system for a specified period of time.
- It must not unload filtered impurities back into the oil stream.

A filter must function effectively for a specified period of time.

First, there must be sufficient space for filtered material to collect without plugging the element; it must withstand the vibration and pressure to which it is exposed; and the material must be resistant to fluids other than oil. Filters or parts of them which compress, collapse, dissolve or disintegrate have no place in an engine. A filter not treated to withstand the damaging effects of water or one that is water soluble is particularly dangerous.

The total filtering area of an element determines somewhat its filtration life. If the area is too small, filter life is short and engine life may be even shorter. Physical dimensions are important, too. Some elements vary in diameter as well as in length and, when used in an engine, offer little if any protection. They may even interfere with normal oil flow.

Be sure and know what's in an element; then change it regularly according to the manufacturer's instructions. The few cents spent for filters will pay large dividends.

About the Author

J. J. KEYES, supervisor of market activities in sales development for Caterpillar Tractor Company, attended Marquette University. He was formerly with Pittsburgh Plate Glass Company, U. S. Tobacco Company, and Trojan Powder Company. In 1943 Keyes became a district representative for Trackson Company, now a wholly-owned subsidiary of Caterpillar Tractor Company. Joining Sales Development division of Caterpillar as a pipe line product and marketing specialist in 1953, Keyes was promoted to his present position this year.

Keep Your Fuel Clean . . .

Too much emphasis cannot be placed on the importance of using only clean diesel fuel. In selecting a fuel, it should be pointed out that distillates are especially desirable because, in refining, they are heated to a vaporous state and condense in another container. Thus, all the sediment and residue remain in the still.

It is not only important to BUY clean fuel, but it must be KEPT clean. The best fuel can be rendered unsatisfactory by inadequate storage facilities or careless handling. The clearance between the fuel injection pump plunger and the barrel is very small, so that the invisible particles of dust that pass through the filters can damage these finely finished and closely fitted parts.

Effort should be exerted constantly to prevent contamination of the fuel. An important step is to reduce the number of times fuel must be handled. When fuel can be delivered by the distributor to storage tanks and then pumped from the storage tank to the engine tank, the handling is reduced to the minimum.

Since natural settling is an effec-

STOP LOSSES,

Operator prepares to reset register on 500 gpm Rotocycle meter and open automatic valve following delivery of 3500 gallon load to tank truck.

SAVE TIME

"Topping-off" Loads

Rockwell *ROTOCYCLE* Meters

With MULTI-STAGE QUANTITY CONTROL

Give "On-the-Nose" Measurement and Smooth Automatic Shut-off

This efficient Rockwell meter-control system will save time, money and effort for all who load tank trucks or tank cars. It provides an accurate *shockproof* way to automatically shut off flow after a pre-selected quantity of lading has been measured. The systematic method it offers for tapering flow when "topping-off" a load prevents errors common to manual operation. And, since the automatic valve closes in three (3) smooth successive stages, there can be no destructive water-hammer or hydraulic shock.

Rockwell Rotocycle Meters with built-in Quantity Control are available in sizes from 2-in through 6-in with a capacity range of from 20 gpm up to 800 gpm. *Steel cases are furnished for refineries.* Write for bulletin OG-454.

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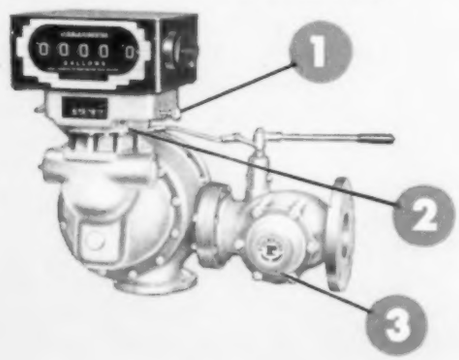
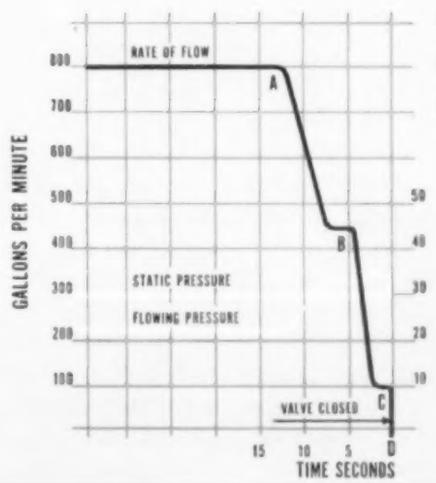
HOW IT WORKS

Model illustrated is 2BL meter-control for smaller flows down to 20 gpm. Operation in all sizes is as follows: (1) Predetermining register is first set to the quantity desired (2) Latch Box then transmits closing action (3) Multi-stage Valve systematically shuts off flow in three smooth stages.

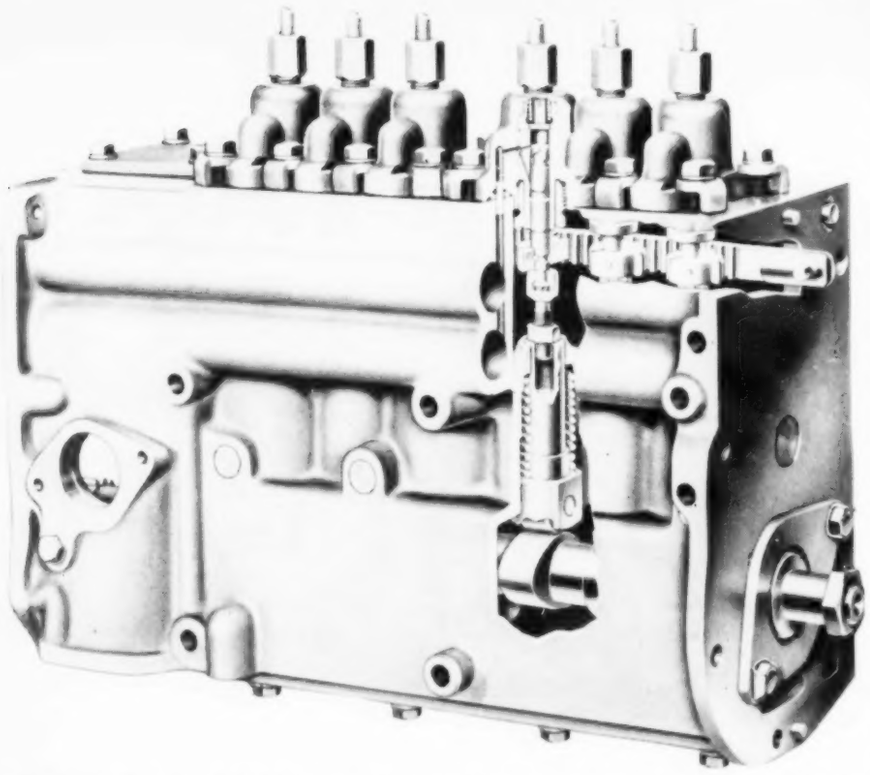


HOW IT PERFORMS



This performance curve is for a 6 BL meter-control. In the chart the flowing pressure curve illustrates how line shock is minimized and pressure smoothed out by use of the multi-stage quantity control valve on Rotocycle meters.

For more data on advertised products, use Readers' Service Cards, last page.



The fuel pump, heart of the diesel engine, is protected by filters. It is machined with close tolerances, so buying clean fuel and keeping it clean will cut down chance of trouble.

tive method of cleaning diesel fuel, the fuel should be allowed to stand at least 24 hours in the storage tank before it is transferred to the engine tank. It is important to drain all water and sediment that has settled to the bottom of the tank before the tank is refilled. Occasionally, all the fuel should be drained and the tank cleaned thoroughly.

Use of cans, funnels, and drums should be discouraged since it is practically impossible to keep this equipment absolutely clean. If drums must be used, they should be allowed to stand at least 24 hours before drawing off the fuel. A pump installation should be used. The drum should stand on end and the inlet for the pump be kept several inches above the bottom to prevent stirring up the sediment that accumulates on the bottom.

The diesel engine fuel tank should be filled at the end of each day to drive out moisture-laden air and prevent condensation. Every 120 hours, before starting the engine, the drain cock under the fuel tank should be opened and any sediment or water which may have accumulated should be drained. The screen in the fuel tank filler opening should be removed and cleaned regularly.

Every 60 hours, drain the fuel filter housing of sediment and water which has settled to the bottom of the compartment.

When filter elements have collected enough contamination to interfere with engine performance, they must be replaced. These elements will continue to absorb particles until fuel will no longer flow through them. They will not discharge their burden into the clean fuel.

Clean kerosine, diesel fuel or non-inflammable cleaning solvent should be used to wash the plate, retainers, retainer rods, pins and springs.

Before installing the elements in the housing, flush out the housing with clean fuel and replace the drain plug. Install the new plate gaskets supplied with each set of elements. An extra set of filter elements should be kept on hand for replacement purposes and should be kept in their original cartons until needed to prevent dust and dirt accumulations.

Air Cleaners . . .

Air cleaners do their work efficiently only so long as the oil level is maintained. For this reason, air cleaners should be inspected frequently and serviced periodically. The interval between oil changes and cleaning will vary with the weather and working conditions.

During dry, dusty months and on jobs where dust conditions are especially severe, it may be necessary to service the diesel engine air cleaner as often as every 5 hours. In damp weather, and on jobs where there is little or no dust, this operation may be necessary only every 60 hours.

Dependence should not be left to visible detection of dust, or lack of dust, in the air as a basis for servicing the air cleaner. The high efficiency of the pre-cleaner prevents the larger dust particles from entering the air cleaner, but it does not exclude the finer ones. For this reason, the oil in the air cleaner may become saturated with fine dust much more rapidly than in instances where the dust is more apparent. The fine particles become suspended in the oil, lowering its cleaning efficiency without leaving noticeable sediment in the cup. Consequently the oil in the air cleaner cup should be changed when, because of fine dust particles, it becomes thicker than normal.

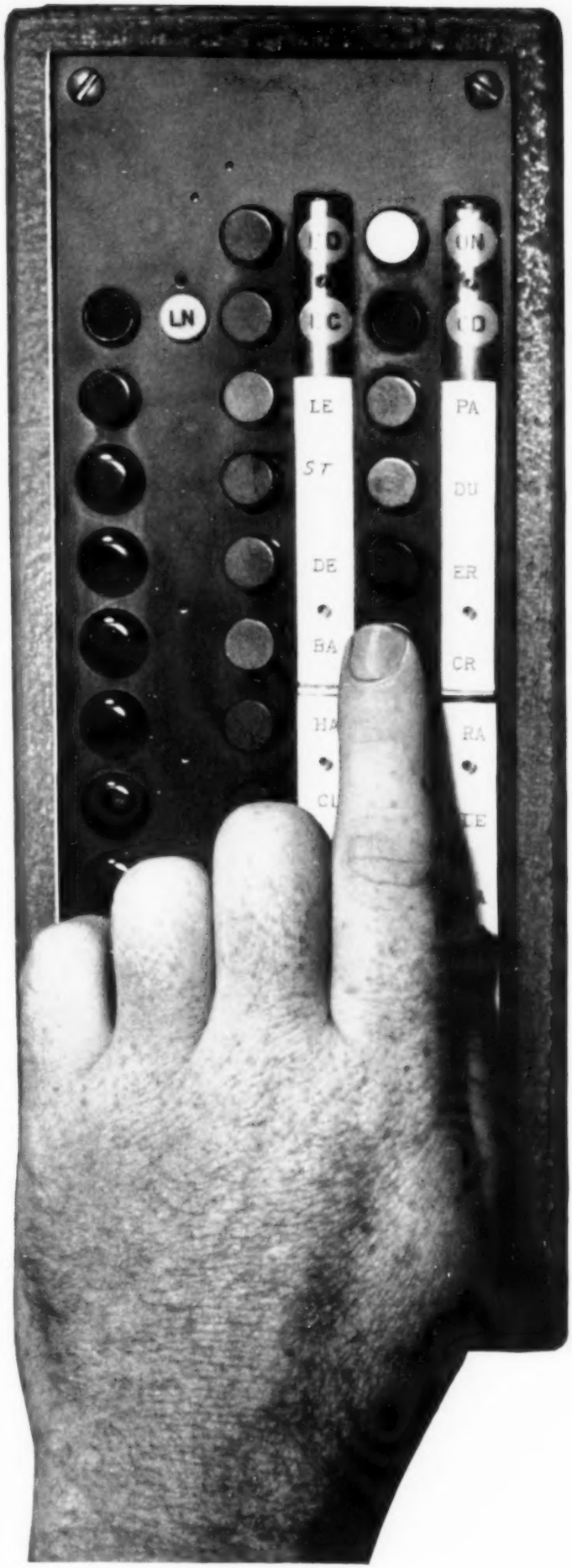
When needed, the air cleaner cup, air inlet pipe and air cleaner screens would be washed, along with the entire pre-cleaner.

Inspect the center tube of the air cleaner and if dirt has collected on the inside, wash it out thoroughly and dry it. At least once a year, and more often under dusty conditions, remove the complete air cleaner from the engine, and after removing the loose screens and oil cup, wash the remainder of the screens thoroughly to remove any oil or dirt which may have accumulated there.

The pre-cleaner jar should be removed and emptied when the level of the dirt reaches ½ to ¾ of the capacity of the jar. Occasionally remove the entire pre-cleaner and wash in non-inflammable cleaning fluid.

A successful maintenance program depends upon proper planning plus care in follow through. But with some thought it can pay real dividends in better machinery performance.

—**The End**



Push-button selector speeds coded data in Gulf Interstate's telemetering system

You are looking at a special push-button private line teletypewriter device developed by the Bell System and used by Gulf Interstate Gas Co.

The company uses the teletypewriter as a recorder in its digital telemetering system, which provides automatic transmission of operating data. Such data includes engine speeds as well as suction and discharge pressures at five remote compressor stations.

The dispatcher in the company's Houston headquarters simply pushes the proper buttons. The selected distant station is instantly on the circuit. Coded telemetered data is then received directly on the teletypewriter in the form of an accurate, easily read record.

This unique selector unit is another example of how equipment developed by the Bell System meets communication needs.

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CHANNELS FOR: DATA TRANSMISSION • TELEMETERING

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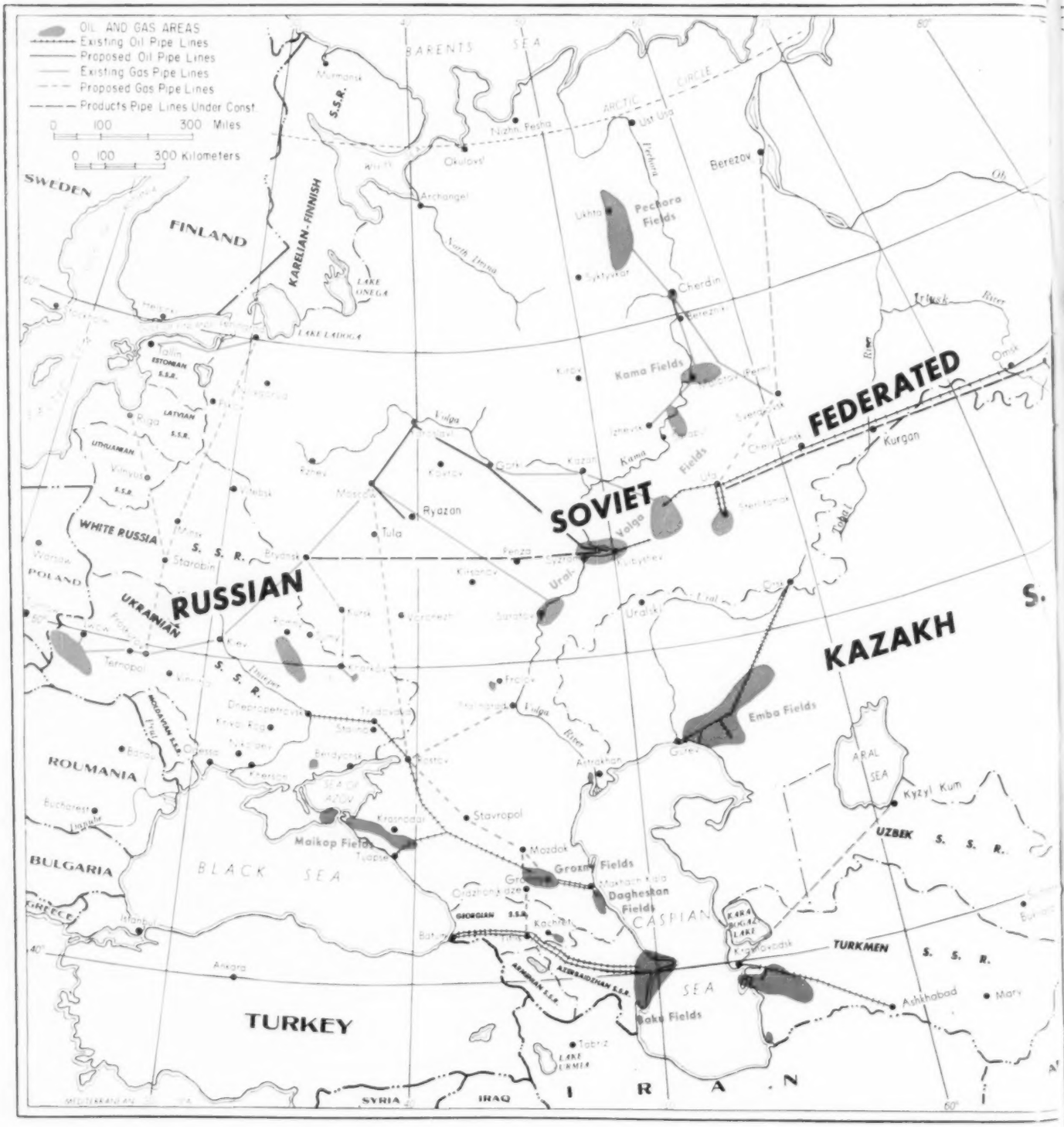
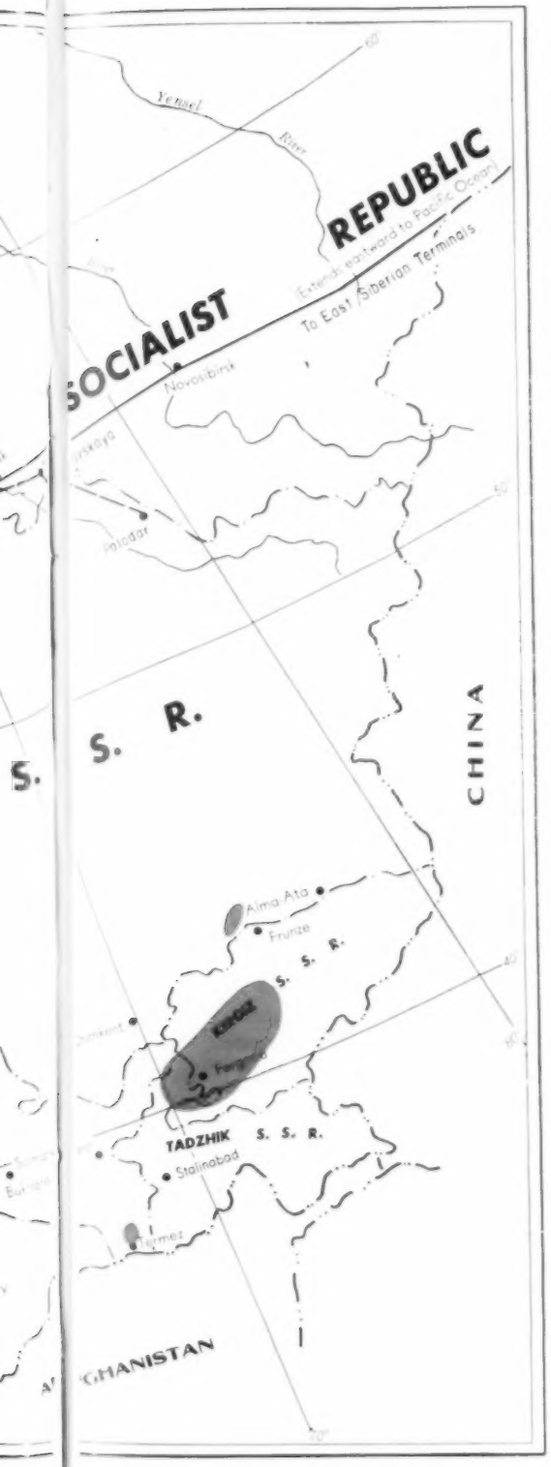
For more data on advertised products, use Readers' Service Cards, last page.

PIPELINING BEHIND THE IRON CURTAIN—



Nearly 20,000 miles of oil and gas pipe line construction are planned in

What the 6th Five-Year Plan Calls For:



sixth Five-Year Plan

- 9400 miles of oil and products lines.
- 5625 miles of gas trunk lines.
- Nearly 5000 miles of intercity gas branch lines.
- 2310-mile oil pipe line across the Urals to eastern edge of Russia.
- Three times more oil production than in '55.
- 4.5 times more gas volume to Moscow than in '55.
- Gas distribution to more than twice as many Russian homes.
- 6.5 times more gas-benzene and liquefied gas production.

THE MOST AMBITIOUS oil and gas pipe line construction program in Russia's industrial history is outlined in the Communist Sixth Five-Year Plan (1956-1960). Total mileage planned: nearly 20,000 miles.

The plans are in line with Pravda's March 17 report that Russia's oil output will treble in the next five years. The new Plan demands "acceleration of the tempo and cutting to a minimum the costs of construction of main pipe lines."

Regarding the future of natural gas, Russian Oil Minister M. A. Evesejenko recently announced: "The Council of Ministers of the U.S.S.R. has issued a decision relating to the development of the gas industry during the next five years. This decision foresees further increase in the output of natural gas, of gas obtained as a by-product, and of artificial gas from coal and shale.

"In the course of the Sixth Five-Year Plan, gas will be supplied to 93 towns. The number of homes where gas is installed will increase 2.2 times and the production of gas-benzine and of liquefied gas will rise 6.5 times. Over 250 industrial enterprises will change over to natural gas or to petroleum gas obtained as a by-product."

Gas Pipe Line Construction to Speed Up. Explaining the tasks of the gas pipe line administration before the delegates of the Meeting of the Communist Party of the Soviet Union, Delegate Furzeva said: "Special attention must be paid to the Saratov-Moscow line. This new gas line is to be put into use one year ahead of schedule—during 1956."

Amortization time for this line was just two years, indicating the great

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Always dependable—whether it operates once per year or several times per minute. It remains operative at all times because dust, dirt, grease or moisture cannot contaminate the contacting elements. There can be no sticking or welding of the contact points.

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Independent outside adjustments are provided for setting both the cut-in and cut-out points. Differential may be widened as desired. No tools are required.

- ***VISIBLE CALIBRATED DIAL***

No guesswork or calculations are required—the pointers indicate on an accurately calibrated dial, the exact operating pressures or temperature.

- ***VISIBLE OPERATION***

You can tell at a glance whether switch circuit is on or off.

- ***BOURDON TUBE OPERATED***

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WRITE FOR BULLETIN 4B

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cost of coal and other fuels used previously. Kazhan, Kaluga, Stalingrad and Rostov are either already connected with this main pipe line or are in the process of being connected.

Furzeva added, "The full utilization of the gas line and increased gas yield at Saratov will permit the 1960 volume of gas to Moscow to exceed the 1955 level 4.5 times. The annual coal requirements of Moscow will thus drop from the 1955 level of 8.6 million tons to 990,000 tons in 1960."

The delegate went on to explain that by this pipe line, due to savings of coal for Moscow, 400,000 railroad freight cars will be freed, in addition to hundreds of thousands of trucks now used for distribution of coal within Moscow.

"All Moscow electric power plants and industrial enterprises, and all municipal and public institutions will then use natural gas exclusively."

Tovarich Ignatiev stated on the same occasion that the "Bashkirian S.S.R. received orders to double gas and oil output in 1960 over the 1955 level. Vezirov, Minister of the Azerbaijan Oil Industry Ministry stated recently: "Azerbaijan gas output in 1960 must double the 1955 yield. It is envisaged that all industrial enterprises in Baku will consume gas instead of other fuels. It is necessary to perform great work in the discovery of gas and expanding the gas consumption network."

Aside from the construction of 4846.6 miles of inter-city gas branch lines, the 1956-60 plan calls for the commissioning of 5625 miles of trunk gas lines. The most important is the Saratov-Moscow line. In addition, several hundred miles of smaller lines will be constructed.

When Russia's stepped-up gas pipe line activity reaches the 1960 mark, 132 towns are expected to be using natural gas as the main primary energy material. The 1956-60 extension of the lines will serve about 1 million Russian customers. This compares with a total population of about 210 million.

Crude and Product Lines. On August 7, the Deputy Head of the Ministry of Construction of Oil Industry Enterprises of the U.S.S.R., reported in a home broadcast from Moscow: "It is planned during the Current Five-Year Plan to build over 15,000 kilometers (9400 miles) of long distance oil pipe lines, exclusive of the internal pipe lines in the Tatar and Bashkir oil fields.

"The biggest project will be a Trans-Siberian trunk line of some 2310 miles. It will go from Tuimaza in the Bashkir (at the foot of the southern Urals in west central Russia) to Irkutsk (on Lake Baikal) and farther on to Bureya and Birobijan (almost to Russia's east coast). The main sector will be the Tuimaza-Irkutsk line linking Ufa, Chelyabinsk, Omsk, Novosibirsk and Krasnoyarsk. Sections of this line have already been built. The Tuimaza-Omsk section, over 815 miles, is completed, crossing the Ural Mountains and six rivers.

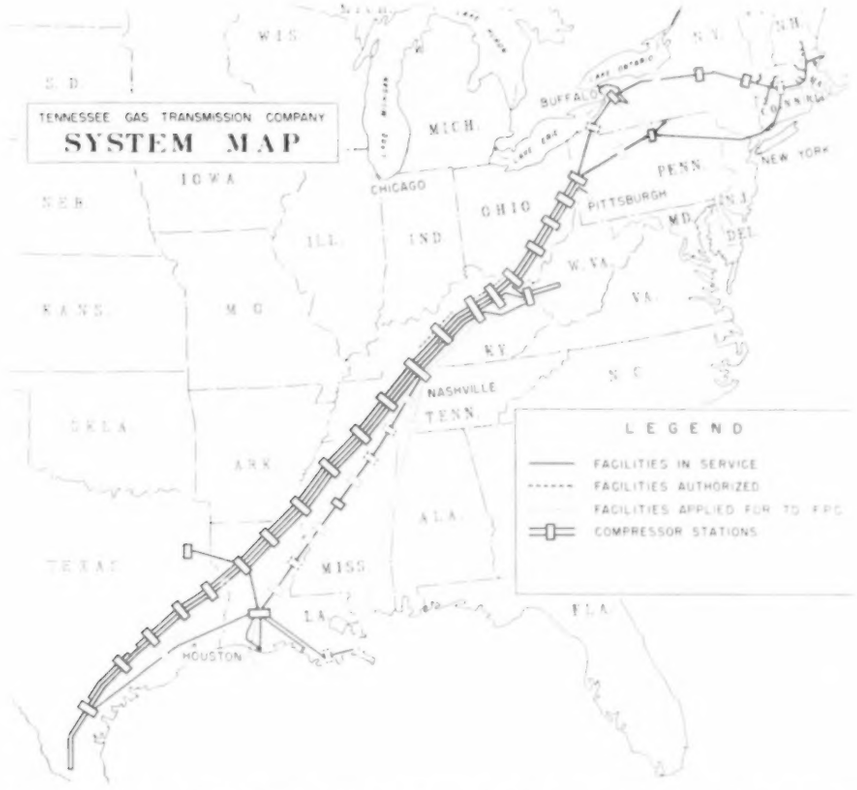
"A second long distance oil pipe line will link the fields in the Tatar oil area with the center of the country, Gorki, Ryazan, Moscow and Yaroslavl. The length of this pipe line will be over 1250 miles. It is now under construction.

"Apart from the trunk pipe line a number of shorter branch pipe lines are being constructed. It is planned to provide product lines to distribute gasoline, diesel fuel, etc. One of these lines will go from Kuibyshev to Bryansk and from there branch off to the various areas of the Belorussian S.S.R. This line is also under construction."

Another long distance products line will be constructed from Ufa in the general direction of Novosibirsk. It will be about 1250 miles long. A section of the line to Omsk is already in operation. By the end of 1956 the product pipe line will get to the virgin land reclamation areas as far as the Tatarskaya station.

Distance Hinders Progress. The Soviets have made considerable progress in oil and gas production, in processing and distribution of crude and gas products. However, the wide distances between fields and centers of consumption hinders a free movement of oil and gas.

On the other hand, motorization is very limited, so that fewer, but individually larger-sized, centers of demand exist. Distribution networks in the U.S.S.R. deal with large quantities rather than maintaining a high number of small but conveniently located retail outlets. —**The End**



Location of proposed TGT facilities which will increase system capacity by more than twice that of original line built in 1943-44.

TGT's $166 Million Expansion Program To Include 1085 Miles of Pipe Line

A $166 million expansion program to add 456 million cubic feet of gas to the average day delivery capacity of its system has been proposed by Tennessee Gas Transmission Company.

TGT has applied to the Federal Power Commission to construct a major enlargement of its system through which gas from new Louisiana tidelands reserves would be transported to supply needs of customers in the Northeast. The expansion would increase system capacity by more than twice that of the original TGT line built in 1943-44.

The proposed facilities include 1085 miles of pipe line, six new compressor stations, enlargements of seven existing stations and a new triple pipe line underwater crossing of the Mississippi River. A 557-mile 30-inch line beginning in the Mississippi delta area south of New Orleans would connect the east end of the company's "Muskrat" gas gathering line with the main company system at Portland, Tenn. Its route would be northeast through Louisiana, Mississippi, Alabama and Tennessee.

A smaller part of the proposed project is 120 miles of 26-inch, 20-inch and 12-inch pipe line to be built from the compressor station at Kinder, La., south to the shoreline and into the Gulf of Mexico to offshore wells where some two trillion cubic feet of gas reserves, newly contracted for by TGT, are located. About 68 miles of this line would be under Gulf waters.

Also proposed are 332 miles of pipe to parallel the existing system, including 276 miles of 30-inch and 26-inch line in Kentucky, 39 miles of 26-inch line in West Virginia, and 22 miles of 26-inch and 24-inch line in Pennsylvania.

A 76-mile, 24-inch pipe line would start at the company compressor station at Coudersport, Penn., adjacent to its Hebron and Harrison storage fields. It would run northwest through the Colden storage field to a compressor station near Buffalo, N.Y. The two stations are located opposite each other on the south and north arcs of the company's 1000-mile pipe line loop which circles through Pennsylvania, New York, Massachusetts, Connecticut and New Jersey.

Six new compressor stations with a total of 53,700 horsepower will be located in Mississippi, Tennessee, New York and Pennsylvania, and 63,540 horsepower in enlargement of seven existing stations in Tennessee, Kentucky, Ohio and Pennsylvania.

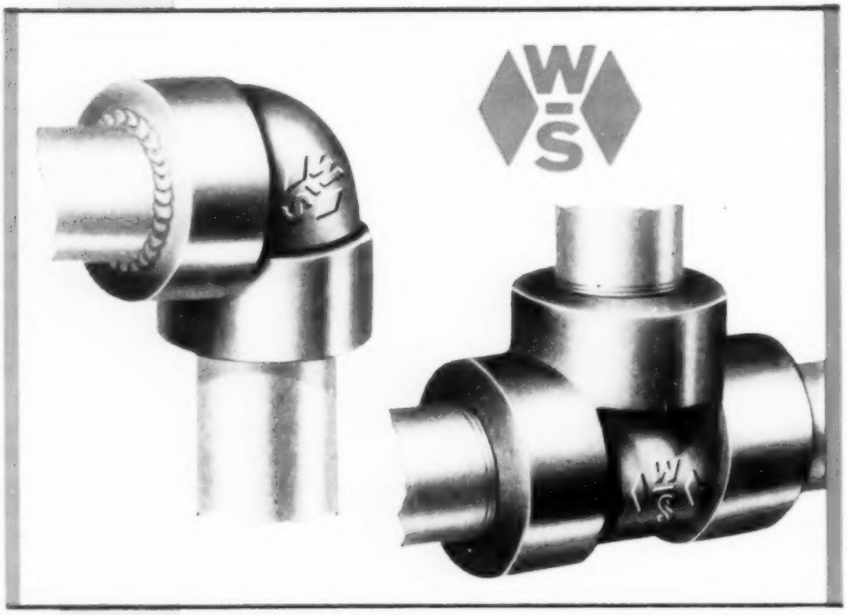
The proposed facilities, when added to those now in service, under construction or covered by pending FPC applications, would increase average-day delivery capacity to nearly 2½ billion cubic feet. Peak day capacity, including that from underground storage fields in Pennsylvania and New York, would be raised to about 3 billion cubic feet.

Two More Spreads Begin Work on Trans-Canada Line

Two more spreads have started work on the Alberta to Winnipeg section of the Trans-Canada Pipe Lines Ltd. natural gas transmission system. Mannix Limited and Dutton-Williams Brothers Limited began work on two sections, about 190 miles of the 574-mile stretch.

Approximately 125 miles of pipe have been laid by two other contractors, Majestic Contractors Limited and Canadian Bechtel Limited, who began work in August on the section from Burstall, Sask., to Moose Jaw.

2 Safe Ways to PROTECT Pressure Piping...



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W-S FITTINGS DIVISION

H.K. PORTER COMPANY, INC.

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Each contractor has a spread of about 110 miles.

Mannix has established construction headquarters in Regina and will work on the line between Moose Jaw and a point near Wolseley, Sask. Dutton-Williams, with a field base at Grenfell, Sask., is working from the Wolseley area to near Miniota, Man.

Marine Pipeline & Dredging Ltd., Vancouver, will begin work immediately on two crossings of the Assiniboine River near Miniota and Portage la Prairie, both in Manitoba.

Contracts for 2 Projects Awarded to Dutton-Williams

Dutton-Williams Brothers Ltd., Canadian affiliate of Williams Brothers Company, Tulsa, has been awarded two contracts for construction of a 46-mile line for Rangeland Pipe Line Company, Ltd., and for compressor stations on the 120-mile line which Dutton-Williams is building for the Westcoast Transmission Company, Ltd., from Taylor, B. C., to Azouzetta Lake, B. C.

The 6 and 12-inch crude oil gathering system for Rangeland will cover the Rimbey-Joffre field in central Alberta and tie in with the Texaco pipe line at Rimbey.

The new Westcoast contract provides for two 18,000 horsepower compressor stations at Fort McLeod and Australian, B. C.

Richfield Signs Gas Contract With Southern California Edison

Richfield Oil Corporation has signed a contract to provide the Southern California Edison Company system with a supply of natural gas over a period of 20 years. Delivery of the gas will begin as soon as necessary facilities have been installed.

Southern California Edison Company will build the 200-mile pipe line system necessary to bring gas into the Los Angeles area from the Richfield producing properties in the San Joaquin Valley.

The price will be related to market conditions throughout the 20-year period and the volume of gas available will depend on Richfield's conservation requirements. Value of the gas to be delivered under the contract probably will range between $200 million and $300 million, according to Charles S. Jones, president of Richfield.

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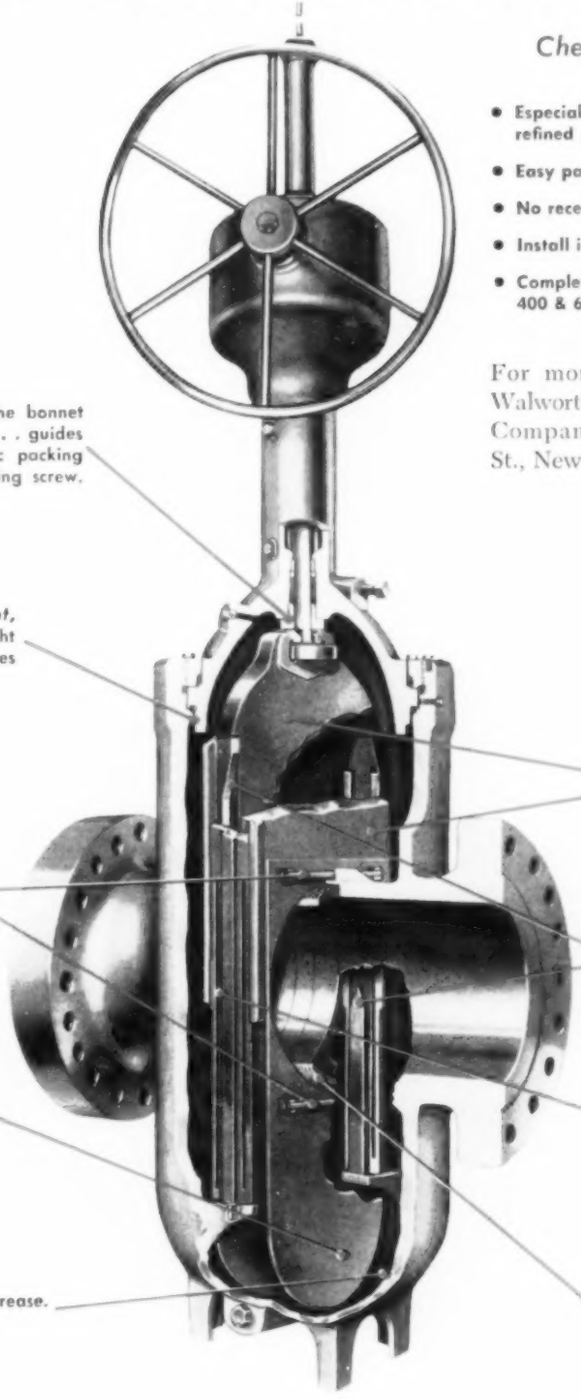

Bonnet bushing screws into the bonnet and is tack-welded in place . . . guides the stem, also retains plastic packing which is adjusted by a packing screw.

Boltless, flangeless bonnet joint, sealed with ring gasket, stays tight at all pressures. This design saves room, weight.

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Loading bars press disc shield plates axially to wipe discs clean while valve is closing or opening.

Leakproof closure, provided by wedging surfaces on each guide and sides of the discs. Wedging surfaces press discs against seat rings.

Disc shield plates contact disc faces at all times to prevent dirt from entering the body cavity.

Loading bars, incorporated on the disc guides, press the discs axially against the seat rings to provide wiping action between the disc and seat ring faces.

Valve needs no body-packing grease.

Backseated seat rings screw directly into body with perfect alignment. Stellite or bronze facing on ring.

Cutaway of a 16-inch Walworth Type 49 Cast Steel Pipeline Gate Valve

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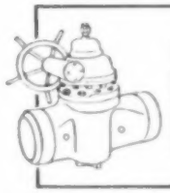

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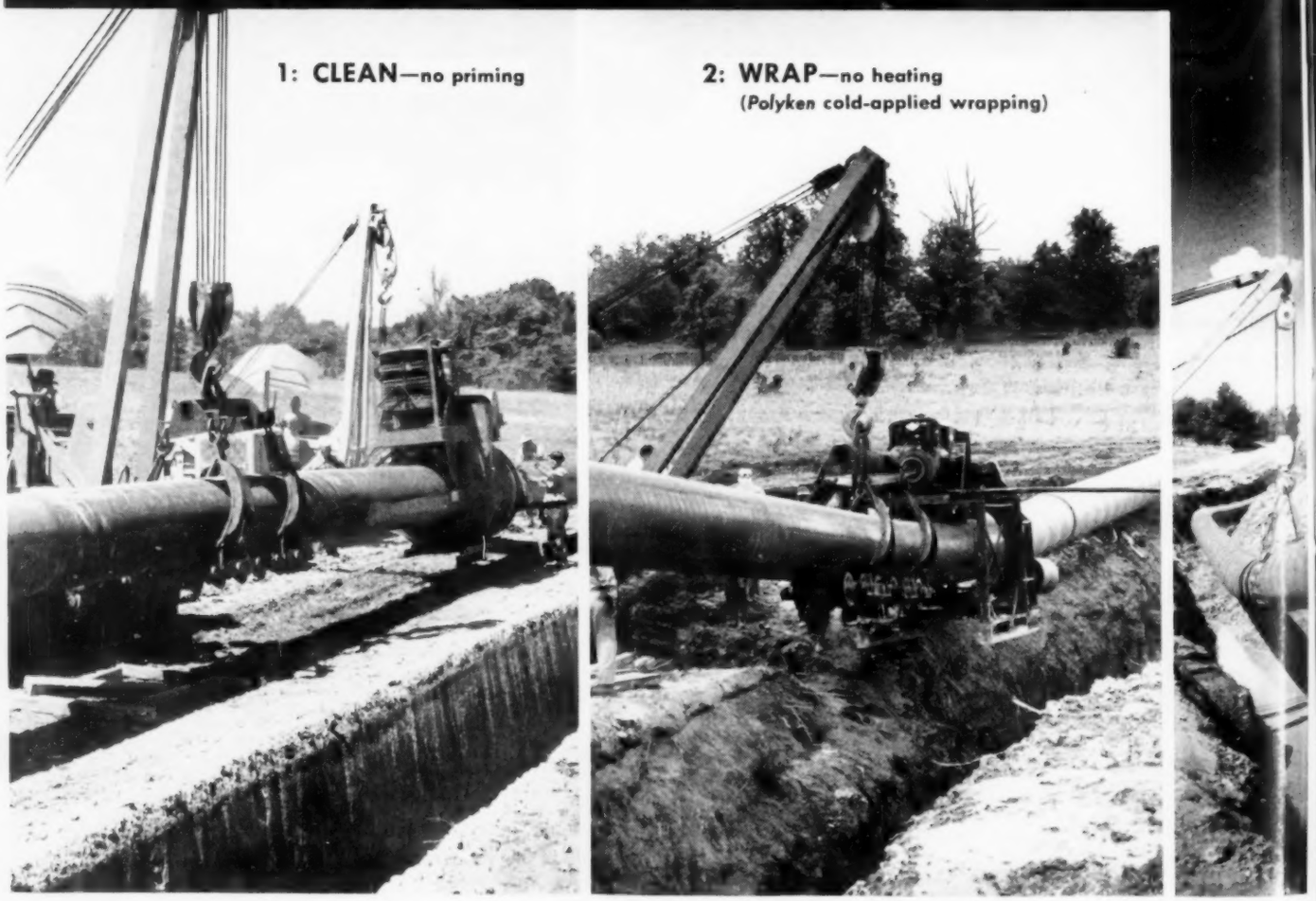

polyethylene tape American-Louisiana line

Michigan)

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1. **Half as many crewmen** needed to do the job.

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No labor or equipment to handle priming operation—*Polyken* tape is cold-applied directly to clean pipe, with the adhesive acting as its own primer.

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2. **No drying or cooling time**—pipe can be tape-wrapped right behind the cleaner and lowered right behind the wrapper; trench can be immediately backfilled.

3. **Vastly reduced warehousing, shipping and handling costs**—coverage per pound is increased; far less material is handled per mile of pipe.

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Complete catalog, Sweet's Industrial Construction File, Sec. 6c/Ke

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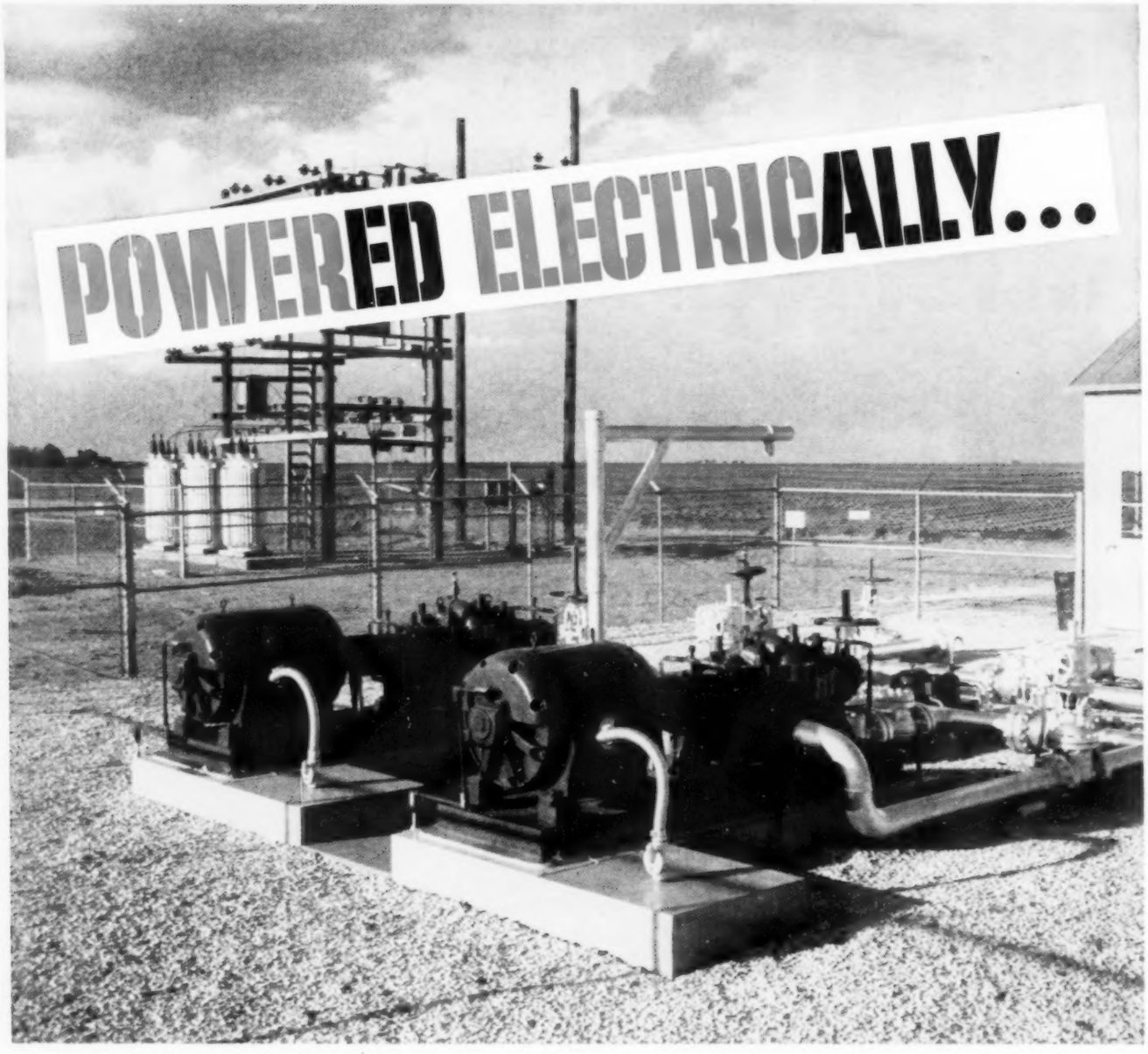

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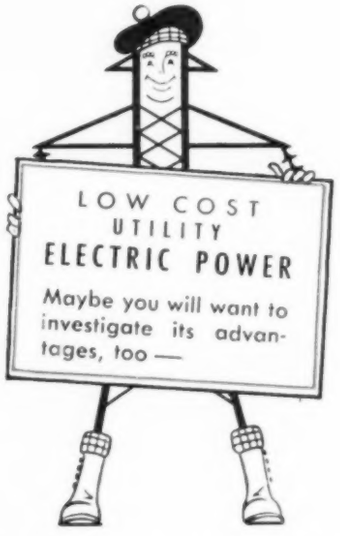

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FPC Authorizes 354 Miles Of Lines for Northern Natural

Northern Natural Gas Company has received authorization from the Federal Power Commission for the construction of approximately 354 miles of pipe line and 18,640 horsepower in compressor capacity to increase the sales capacity of the company's system in the Midwest by about 65 million cubic feet of natural gas daily.

The project includes a 163-mile pipe line extension of Northern's system from Sioux Falls, S. D., to Aberdeen, S. D., with about 160 miles of branch lines to serve 20 new wholesale customers in South Dakota.

The certificate also authorizes Northern to supply additional gas to present customers and to provide new service to eight towns in Iowa; to supply additional gas to the Allied Chemical and Dye Corporation's ammonia plant near Omaha, Neb.; and to serve the St. Paul Ammonia Products, Inc., plant at Rosemont, Minn.

The authorized facilities are part of a larger expansion program proposed by Northern, which also includes an extension of the company's system to the Duluth-Superior area. The latter is in competition with Midwestern Gas Transmission Company's proposed system, pending before the FPC.

Increase in Gas Facilities Planned by Texas Gas

Approximately 40 miles of pipe line and 12,000 horsepower of additional compressor capacity are included in the $6 million project which has been authorized by the Federal Power Commission for Texas Gas Transmission Corporation. The facilities, located in Louisiana, Mississippi, Kentucky, Illinois and Indiana, will increase the company's deliveries to existing customers by 25,602,000 cubic feet daily.

Proposed construction includes sections of loop and connecting lines near Lake Arthur field, La.; Bosco, La.; Greenville, Miss.; Clarksdale, Miss.; Robinson, Ill.; and Hickory School storage field, Ky. Additional compressor horsepower units are proposed for stations at Pineville, Columbia and Bastrop, La.; Covington, Tenn.; Jeffersontown, Ky.; and Dillsboro and Oaktown, Ind.

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For more data on advertised products, use Readers' Service Cards, last page.

Colorado Interstate Amends Gas System Expansion Plans

Colorado Interstate Gas Company has applied to the Federal Power Commission to amend its Beatrice project by redesigning the transmission system expansion proposed in March and to retire from service some company facilities along the original transmission line from the Texas Panhandle to Denver.

Total cost of the transmission facilities proposed under the amendment is estimated at $87 million. This is part of a 1956-1957 expansion program which will cost about $120 million. Included in the two-year program are completion of the company's transmission line from Rock Springs, Wyo., to Denver, which is now under way and additions to producing properties and gathering line.

New transmission facilities proposed in the amended application include the following:

1. A 215-mile 26 to 36-inch line from the Texas Panhandle to the Kit Carson station paralleling the present transmission line. This line will handle gas presently transported in the old line as well as additional gas for the Rocky Mountain and Midwest area.

2. A 100-mile 24-inch line between the Springfield compressor station and Pueblo.

3. A 345-mile 30-inch line from Kit Carson to Beatrice, with delivery to Natural Gas Pipeline Company of America.

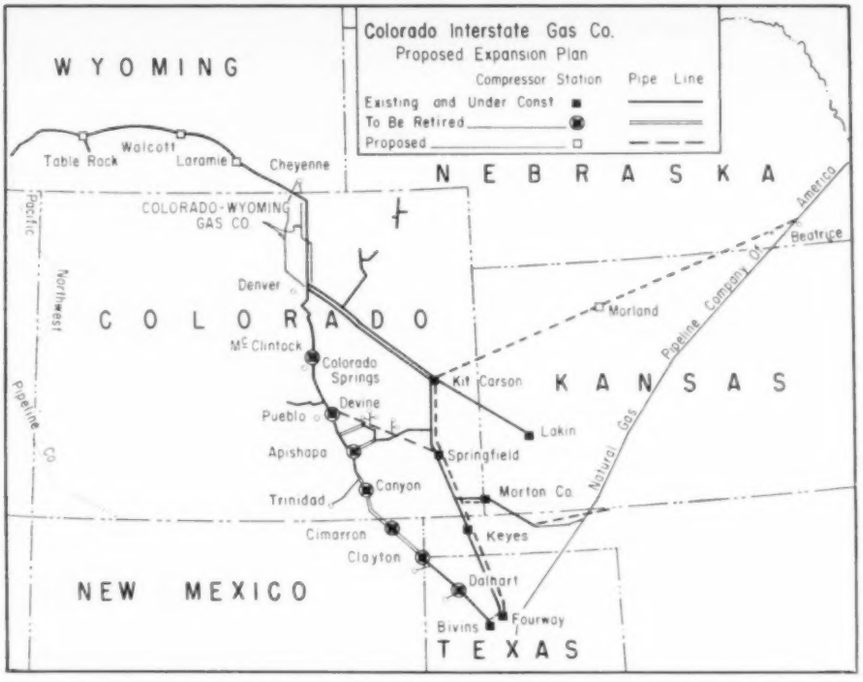
4. A 50-mile 22-inch line extending the Company's system at Hooker, Okla., to transport reserves from the Mocane and Laverne fields in Beaver and Harper counties of Oklahoma into Colorado Interstate's transmission system.

5. A 24-mile 24-inch pipe line from the Greenwood area to the Panhandle-Kit Carson loop system which will parallel an existing line.

6. New compressor station facilities, totaling 60,980 compressor horsepower, at Table Rock, Walcott and Laramie, Wyo., and at Morland, Kansas. Horsepower capacity also will be boosted at seven existing Colorado Interstate compressor stations under the new proposal.

Facilities to be retired from service under the revision of the Beatrice project include seven compressor stations on the company's old line between the Texas Panhandle and Denver; 87 miles of 22-inch transmission line between Clayton, N. Mex., and Trinidad, Colo.; and 39 miles in the Arkansas Valley area.

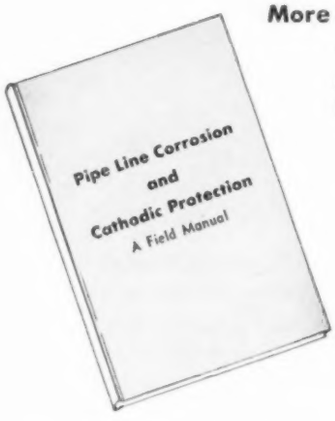
Delivery capacity to Natural Gas Pipeline Company of America at Beatrice will be 460 million cubic feet daily under the amendment.



Revised route of Colorado Interstate's proposed expansion plan announced in March.

More comments on this new Handbook:

". . . a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



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Proposed Pipe Line Construction

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alberta Gas Trunk Line, Ltd.	547	6-34	Gas	From Alberta fields to western terminus of Trans Canada Pipe Line, Ltd.	$47 million	Approved
American Gilsonite Company	71	6	Gilsonite Slurry	From Bonanza, Utah, to Gilsonite, Colo.	$2 million	Approved
Andes Pipeline Corp.	500	12	Gas	From Villamontes, Bolivia, across Andes to Antofagasta, Chile	$30 million	Planned
Bolivian Gulf Oil Co.	201	8-10	Crude	Sicasica, Bolivia to Arica, Chile	$10.5 million	Planned
British Petroleum Company		16	Crude	Popton Point, South Wales, to Llandarcy refinery	$14 million	Considered
Chaco Pipeline & Refinery Corp.	450	.....	Products	From Glenn McCarthy's Bolivian wells to new refinery at Conception, Paraguay	.....	Planned
Cities Service Gas Co.	35	6, 12, 16	Gas	Facilities in Kansas, Missouri, and Oklahoma	$2.8 million	Authorized
	28	20-30	Gas	Facilities in Oklahoma	$1.4 million	Authorized
Coastal Transmission Corp.—Houston, Texas	565	20-26	Gas	McAllen, Texas—Louisiana connection, Houston, Texas-Gas, plus 272 miles of laterals	$68 million	Before FPC
Colorado Interstate Gas Co., Colorado Springs, Colo.	734	22-34	Gas	Texas & Oklahoma Panhandle to Kit Carson, Colo., to Beatrice, Neb.	$87 million	Before FPC
	36	26	Gas	East Denver to South Denver station and loop of Portland lateral	$1.3 million	Authorized
Compania Shell de Venezuela	177	20	Gas	La Paz field to Cardon refinery on Paraguana peninsula	$20 million	Planned
Consolidated Gathering Systems, Ltd.	198		Crude	Sturgeon Field—Edmonton	.....	Planned
Creole Petroleum Corp.	94	28	Crude	Temblador to Caripito, Venezuela	$5.6 million	Planned
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border	.....	Planned
El Paso Natural Gas Co.	888	.....	Gas	Facilities in Texas, New Mexico, and Arizona to deliver gas near Blythe, Calif. and Topock, Ariz. to So. Counties Gas Co., So. Calif. Gas Co. and Pacific Gas & Electric Co.	$84.5 million	Before FPC
	108	.....	Gas & Products	Facilities in Andrews and Ector Counties, Texas	$5 million	Authorized
	28	10	Gas	Nolan and Coke Counties, Texas, plus compressor station facilities	$1 million	Authorized
El Paso Natural Gas Products Co.	240	8	Products	Midkiff natural gasoline plant in Permian Basin to El Paso	.....	Planned
Houston Texas Gas & Oil Co.—4604 Main St., Houston	961	12-30	Gas	Baton Rouge, La. to Miami, Fla. plus 496 miles of laterals and compressor facilities	$105 million	Before FPC
Inland Natural Gas Co.	320	6-12	Gas	To tap Westcoast Transmission's trunk line at Savona, British Colombia.		Planned
Interprovincial Pipe Line Co.	150	20	Crude	Sarnia, Ont. to Toronto, Ont.		Planned
Interstate Oil Pipe Line Co.	55	8	Crude	Billings, Mont. to Wolf Springs, Mont.		Considered
Iraq Petroleum Co.	50	24	Crude	Homs, Syria, to Mediterranean		Considered
	1,200	38-40	Crude	Kuwait to Iskenderun, Turkey		Considered
Iron Ranges Natural Gas Co.	115	.....	Gas	From Itasca and St. Louis Counties along route of Mesabi range from Grand Rapids to Aurora, Minn.	$5 million	Before FPC
Iroquois Gas Corp.—Buffalo, N.Y.	36	.....	Gas	Facilities in Chautauqua, Cattaraugus and Erie counties, N.Y. to develop new underground storage area for natural gas	$2.5 million	Authorized
Israel Government	70	6	Products	Haifa to Tel Aviv	$1 million	Planned
Kansas-Nebraska Natural Gas Co.	32	.....	Gas	Facilities in Nebraska	$4 million	Authorized
Magna Pipeline Company	40	.....	Gas	Underwater line from Anacortes, Wash. to Victoria, B.C.	$6 million	Planned
Magnolia Pipe Line Co.	.....	8, 12	LPG	Facilities in Andrews County, Texas	.....	Planned
Mene Grande Oil Co.	62	30	Crude	Anaco to Puerto La Cruz, Venezuela	$5.8 million	Considered
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	472	4-24	Gas	Main line loops and extensions in Wisconsin, Illinois	$17.6 million	Before FPC
	252	.....	Gas	Loops in Missouri, Iowa, Wisconsin and Illinois	.....	Contracts let for 228 miles
Midwestern Gas Transmission Co., Houston, Texas	1112	.....	Gas	Emerson, Manitoba—Nashville, Tenn.	$98 million	Before FPC
Montana-Dakota Utilities Co.—Minneapolis	44	.....	Gas	Various locations in S.D. and Wyoming	$1.4 million	Authorized
	41.8	12	Gas	Williams County, N.D.	$1.4 million	Authorized
	28	12	Gas	Fallon County to Dawson County, Mont. and compressor facilities	$776,280	Contract let
Mountain Fuel Supply Company	38	20	Gas	Parallel line and facilities to transport gas from Pacific Northwest line in Sweetwater County, Wyo.	$3 million	Authorized
NATO	1920	4-10	Products	To serve military bases in Western Europe		Foster-Wheeler Prime Contractors, 1330 miles let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Authorized
	25		Gas	Quinduno field in Roberts, Count Texas	$3.2 million	Authorized
	480	30, 36	Gas	Loops at various points along existing line	$80 million	Before FPC
New York State Natural Gas Corp.	27	.....	Gas	Elk County, Penn. to Luthersburg gas field in Clearfield, Jefferson and Indiana Counties, Penn.	$1.5 million	Authorized
North Carolina Natural Gas Corp.	575	3-16	Gas	Mooresville eastwardly across North Carolina	$13 million	Authorized
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	42	10	Gas	Rochester, Minn. to Winona and Goodview, Minn.	$963,000	Before FPC
	163	.....	Gas	Extension of system from Sioux Falls, S.D. to Aberdeen, S.D., plus 160 miles of branch line	.....	Authorized
Northwest Pipeline Corp.	350	.....	Crude & Products	Four Corners area to Salt Lake City, Utah	$15 million	Planned
Offshore Gathering Corp., Houston	364	24, 26, 30	Gas, Crude	Texas side of Sabine River 25 miles offshore La. to Mississippi side of Pearl River	$150 million	Planned
Pacific Gas & Electric Co.	150	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$20 million	85 miles let
Pacific Northwest Pipe Line Corp.—Salt Lake City, Utah	83	12, 18, 20	Gas	Glenn County areas to Sacramento region	$5 million	Planned
	50	4-6	Gas	To serve industrial customers at Uravan and Nucla, Colo.	$1 million	Authorized
Pembina Pipe Line, Ltd.	100	.....	Crude	Gathering line and new pumping unit in West-Central Alberta	$4.5 million	Planned
Pennsylvania Gas Co.	38	8, 10	Gas	In Erie and Warren Counties, Penn., and Chautauqua County, N.Y.	$930,000	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	80	8	Products	Guaymas—Los Mochis	$1 million	Planned
Piedmont Gas Co.—Hickory, N.C.	78	2-8	Gas	From connection with Transcontinental Gas Pipe Line to serve customers in North Carolina	$2.6 million	Before FPC
Royal Dutch Shell	700	30	Crude	Mediterranean Sea to North Sea ports	$280 million	Considered
Saskatchewan Power Corp.	80	.....	Gas	Hatton gas field to Success, Sask.	.....	Planned
	40	.....	Gas	Moose Jaw, Sask. to Regina, Sask.	.....	Planned
Scranton-Spring Brook Water Service Co.	37	12	Gas	Hebron-Greenwich facilities of Tennessee to Scranton and Wilkes-Barre, Pa.	$1.6 million	Before FPC
Sinclair Oil & Refining Co. and Socony Mobil Oil Co.	211	.....	Crude	San Silvestre field, Barinas, Venezuela, to Puerto Cabello on Caribbean sea coast	$25 million	Planned
Sohio Petroleum Co.	37	8	Products	Mogadore to Girard, Ohio	.....	Planned
South Alberta Pipe Line, Ltd.	46	10	Gas	Etzikom Field—Medicine Hat, Alberta	$1 million	Planned
South Saskatchewan Pipe Line Company	58	12	Crude	Cantuar field to Dollard field, Saskatchewan	$3 million	Approved
Southern Natural Gas Company	52	.....	Gas	Various locations in Ga. and La.	$2.2 million	Authorized
	28	8-12	Gas	Connect 3 gas fields to east leg of south La. supply system plus compressor station additions.	.....	Before FPC
Southern Pacific Pipe Lines, Inc.	300	.....	Products	From San Francisco Bay area to Reno—Fallon, Nev. area	$16 million	Approved
Stanmount Pipe Line Co.	140	10	Crude	Cayiga and Beaver Lake Fields, N.D. to connect with Interprovincial Pipe Line	.....	Planned
Sturgeon Pipe Line, Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6.5 million	Planned
Tecumseh Pipeline Co.	190	20	Crude	To connect to principal crude line carriers in Chicago area for movement to east	.....	Planned

Continued on Page 72

Canada's first

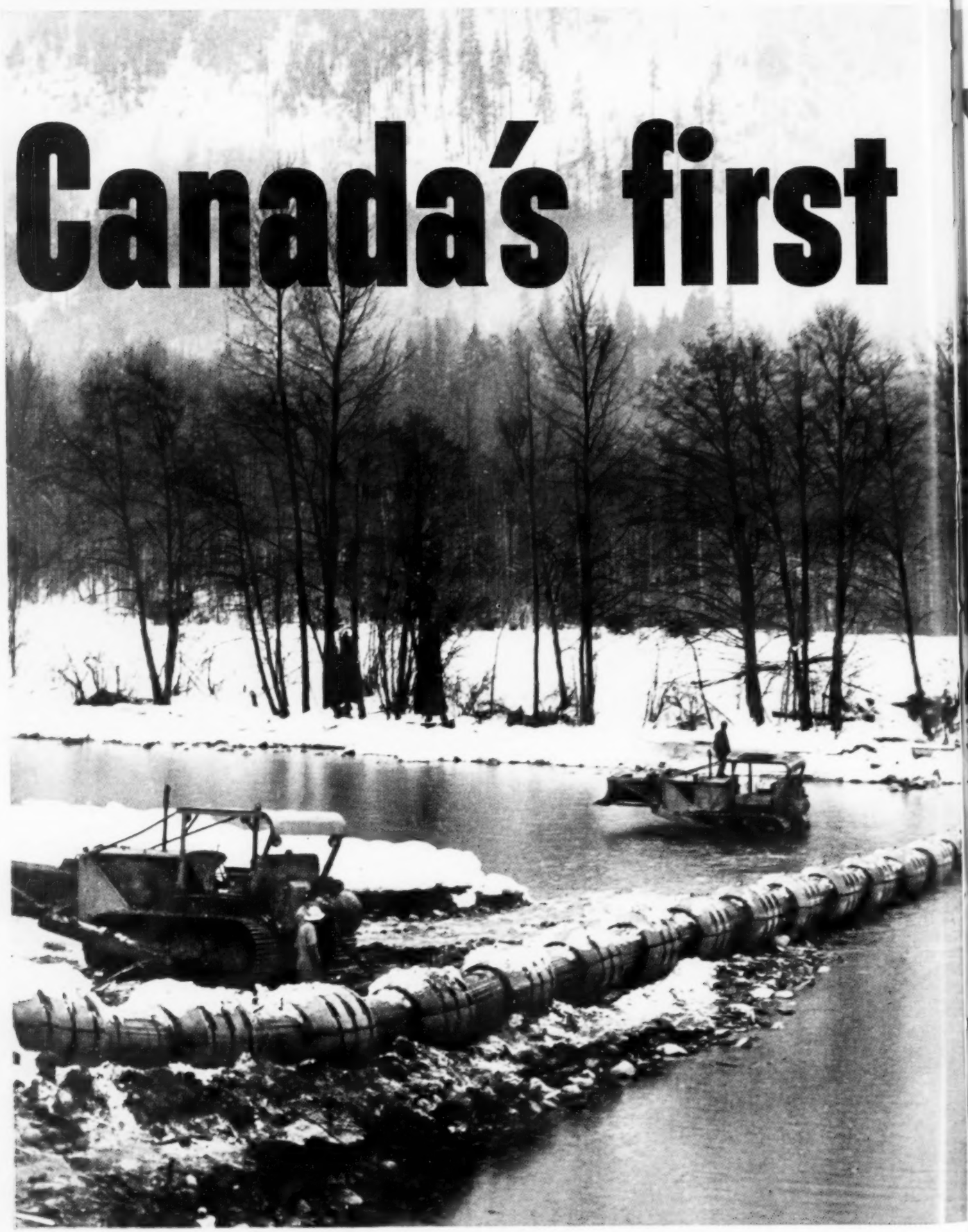

Photo shows the crossing of the Coquihalla River near Hope, British Columbia. The 30-inch diameter pipe is loaded with river weights and laid in a ditch beneath the river bed with eight feet of cover. Some of the river crossings, like this, were intentionally made during the winter when the water was at its lowest level.

"BIG INCH"

Kick-off for the line was at Huntington, B.C. Linkup with Pacific Northwest Pipelines is a short distance east of Vancouver. Westcoast has been authorized to draw gas from more than 42 million acres in the Peace River section in Alberta and British Columbia.

Westcoast Transmission Company, Limited, lays natural gas pipelines which will link British Columbia and New Mexico

TO tap the prolific gas resources of northeastern British Columbia and northwestern Alberta, Westcoast Transmission Company is now laying a 30-inch pipeline from the fields, almost due south to the international border near Vancouver. The line will provide natural gas for British Columbia and Pacific Coast States, the latter through a linkup with Pacific Northwest Pipeline Corporation which is currently completing a pipeline from New Mexico to the Northwest area.

Westcoast Transmission's 688-mile main line will have a maximum capacity of 660 million cubic feet per day and its completion will mark the first large-scale interchange of natural gas between western Canada's new and expanding fields and United States markets. Canadian Bechtel Limited are managers of engineering and construction for the project.

Marks first deliveries of 30-inch pipe from A. O. Smith Milwaukee plant

Approximately 22% of the 30-inch pipe used by Westcoast Transmission was shipped to the job from A. O. Smith's Milwaukee pipe mill. It was the first pipe of this size produced in the Milwaukee pipe mills' new facilities.

For almost 30 years . . .

A. O. Smith line pipe has always been manufactured to a high standard of quality . . . precisely controlled at every step of production. That's why A. O. Smith pipe, made and installed in 1928, is still in operation. That's why so much A. O. Smith pipe is in nearly every important high-pressure line.

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For more data on advertised products, use Readers' Service Cards, last page.

Proposed Pipe Line Construction—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Tennessee Gas Transmission Co.—Box 2511, Houston (See also Midwestern Gas Transmission Co.)	100	....	Gas	Gathering lines in Texas and Louisiana plus station additions	$18.6 million	Before FPC
	1085	12-30	Gas	Southeast La. to Portland, Tenn.; from Kinder, La., to offshore wells in Gulf of Mexico; from Coudersport, Penn., to Hamburg, N.Y., and loop lines in Ky., W. Va., Penn.; compressor stations in Miss., Tenn., N.Y., Penn.; and additions in Tenn., Ky., Ohio, and Penn.	$166 million	Before FPC
	162	26, 30	Gas	Loop Lines in Kentucky, Ohio, and Pennsylvania	$24.3 million	Contracts let
Texas Eastern Transmission Corp.	422	30	Gas	McAllen to Vidor, Texas	Estimated	Before FPC
	530	30	Gas	Loops at various points between Kosciusko, Miss. and Uniontown, Penn.	Cost of Entire Project	Before FPC
	45	24	Gas	Provident City, Texas crossover to McAllen-Vidor line	$150	Before FPC
	135			Supply and delivery lines laterals	Million	Before FPC
Texas Illinois Natural Gas Pipeline Co.	38	36	Gas	Loops facilities in Illinois	$6.4 million	Before FPC
Texas Gas Transmission Corp	40	6-30	Gas	Parallel lines and compressor additions on existing lines in Louisiana, Missouri, Mississippi, Illinois, Kentucky	$6 million	Authorized
	....	....	Gas	To deliver gas from four Louisiana gas fields to American Louisiana system.	$783,100	Authorized
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2250	30, 36	Gas	Alberta—Eastern Canada	$378 million	Contracts let for 4 spreads
Trans Carolina Pipeline Co.	280	8-18	Gas	Transmission line and compressor facilities plus 567 miles of laterals in tidewater areas of North and South Carolina	$21.6 million	Before FPC
ranscontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
	12	....	Gas	Live Oak gas field, Vermillion Parish, La. plus two meter stations	$707,000	Before FPC
	277	30, 36	Gas	In Louisiana, Mississippi, Alabama, Georgia, S. Carolina, N. Carolina, Virginia, Maryland, Pennsylvania	$42 million	Contract let
	74	30, 36	Gas	In Louisiana, Mississippi, Alabama, Georgia, South Carolina, North Carolina, Virginia and Pennsylvania	$8.5 million	Contract let
Union Oil Co. of Calif.—Los Angeles, Calif.	225	12, 16	Crude & Products	San Joaquin Valley to Union Oil's Oleum refinery on San Francisco Bay.	.....	Planned
United Fuel Gas Co., Charleston, W.Va.	18	12	Gas	Coco compressor station in Kanawha County, W. Va., to Belle, W. Va.	$845,853	Authorized
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Washington Gas Light Co.—Washington, D.C.	28	20, 24	Gas	From metering station of Atlantic Seaboard Corp. to Washington to connect with line leading to District of Columbia facilities	$3.4 million	Authorized
Westcoast Transmission Company, Ltd.	270	8-26	Gas	Various locations in Peace River region	.....	Contracts let for 155 miles
Wilcox Trend Gathering System, Inc.	16	16	Gas	Gathering lines to Provident City, Texas	$2.9 million	Before FPC
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Yacimientos Petroliferos Fiscales	808	....	Gas	Campo Duran, to Buenas Aires, Argentina	$76 million	Planned
	635	....	Crude	Campo Duran to San Lorenzo, Argentina	$24 million	Planned
	621	....	Crude	Mendoza to San Lorenzo, Argentina	$19 million	Planned
Yacimientos Petroliferos Fiscales Bolivia	186	....	Crude	Camiri field to Santa Cruz, Bolivia	$4 million	Contract let
	86	....	Crude	Yacuiba to Bermejo, Bolivia	$3 million	Considered

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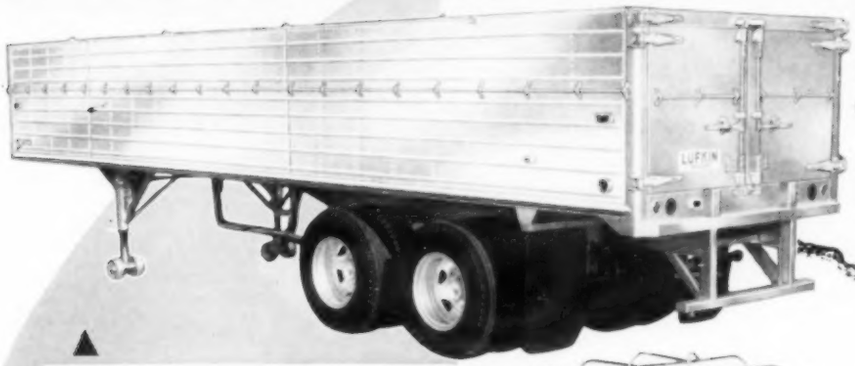
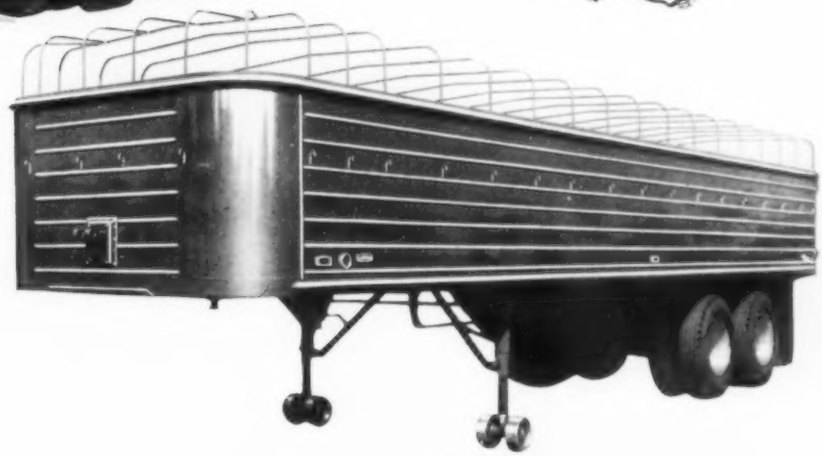


ALUMINUM FRAMELESS – LIGHTWEIGHT FOR GRAIN AND BULKY LOADS



ALL STEEL – FRAMELESS – MEDIUM WEIGHT – RUGGED PERFORMANCE

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Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.

Engineering Design **—29—How to determine the buoyancy of bare and concrete coated steel pipe in water and mud.**

To find the buoyancy of bare steel and concrete coated pipe in water in pounds per foot:

$$\text{Buoyancy (B)} = \frac{D}{3}(D - 32t) + 11t^2 \text{ for bare pipe;}$$

$$\text{and } B = \frac{D}{3}(D - 32t) + t_1 D \frac{63 - W_c}{48}$$

for coated pipe;

where D is outside diameter of pipe in inches
t is wall thickness of pipe in inches
t_1 is thickness of concrete coating in inches
W_c is weight of concrete in pounds per cubic foot

To find the buoyancy of bare steel and coated pipe in mud in pounds per foot:

$$\text{Buoyancy (B)} = 10.7\left(\frac{DW_m}{2000} - t\right) + 11\,t^2 \text{ for bare pipe;}$$

$$\text{and } B = 10.7\left(\frac{DW_m}{2000} - t\right) + t_1 D\left(\frac{W_m - W_c}{48}\right)$$

for coated pipe;
where Wm is weight of mud in pounds per cubic foot.

Example 1: Find the buoyancy of steel pipe with 20-inch OD and ½-inch wall thickness in water. What thickness of concrete coating would be required to give this pipe a negative buoyancy of 100 pounds per foot ($W_c = 143$)?

$$(B) = \frac{20}{3}[20 - 32(\tfrac{1}{2})] + 11(\tfrac{1}{2})^2$$

$= 26.7 + 2.8 = 29.5$ pounds per foot positive buoyancy.

To give this pipe a negative buoyancy of 100 pounds per foot:

$$-100 = \frac{20}{3}[20 - 32(\tfrac{1}{2})] + t_1(20)\left(\frac{63 - 143}{48}\right)$$

$$-100 = 26.7 - 33.3\,t_1$$

$t_1 = 3.8$ inches of concrete coating.

The error introduced by this method is about 15% but would be less as the thickness of coating decreased.

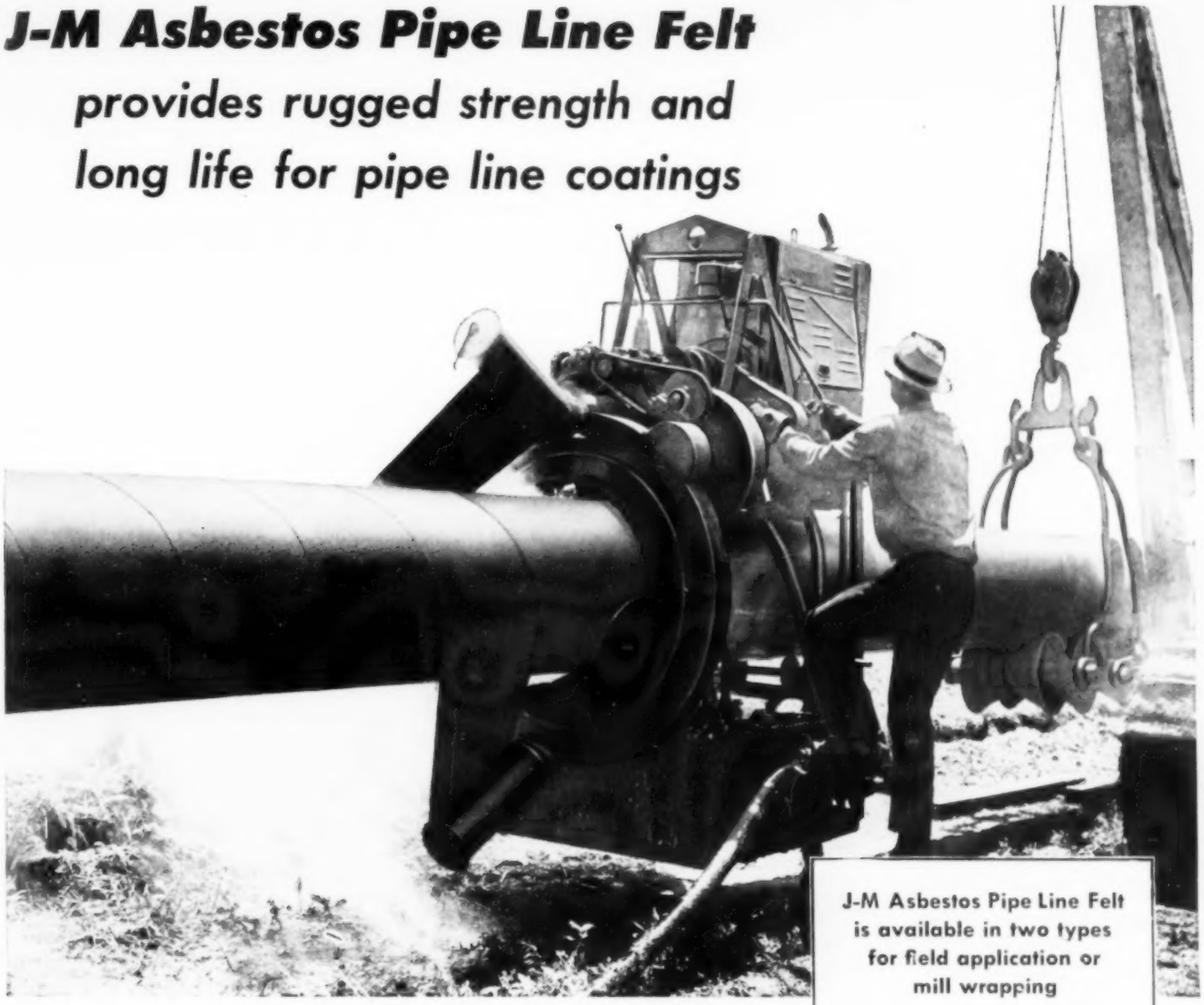
Example 2: Bottom conditions at a certain crossing that require the pipe to have a negative buoyancy of at least 50 pounds per foot. Let's check to see if a 10-inch pipe having a 2-inch coating of concrete ($W_c = 143$) has sufficient negative buoyancy?

$$B = \frac{10}{3}\left(10 - 32(\tfrac{1}{2})\right) + 2(10)\left(\frac{63 - 143}{48}\right)$$

$B = -20 - 33.3 = -53.3$ pounds per foot; so coated pipe meets design requirements.

J-M Asbestos Pipe Line Felt

provides rugged strength and long life for pipe line coatings



Permits high-speed wrapping and effective protection for enamels

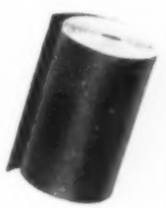
Johns-Manville Asbestos Felt gives pipe line coatings the rugged strength that is needed to guard the enamel from years of soil action. It forms a *stable* coating to reduce the hazards of pipe line corrosion leaks and provides a sound foundation when cathodic protection is used. Inorganic asbestos felt is the only wrapper that has survived more than half a century of actual service conditions in all types of soils.

J-M Asbestos Pipe Line Felt acts as a continuous sheath over the enamel . . . guarding the coating from the effect of the shifting grip of the soil as it expands and contracts due to alternate wetting and drying. It resists the destructive action of bacteria, fungi and soil chemicals, thus assuring long life to pipe line coatings.

J-M Asbestos Pipe Line Felt is available in two types for field application or mill wrapping

Transhield® Asbestos Pipe Line Felt—for average soil conditions.

#15 Asbestos Pipe Line Felt—heavy-duty material for severe soil conditions where a heavier material is desired.



For further information about Johns-Manville Products for Pipe Line Protection, write to Johns-Manville, Box 14, New York 16, N. Y., in Canada, Port Credit, Ontario.

Johns-Manville **ASBESTOS FELT FOR PIPE LINE PROTECTION**

"You can't beat this HD-16 for handling pipe around loose gravel ditch," says Latex spread foreman

Allis-Chalmers HD-16 with Tractomotive side boom makes cradling easy on Latex of Georgia's 16- and 20-inch gas line job through tricky Wisconsin glacial deposits

Latex Construction Company of Georgia finds its Allis-Chalmers HD-16 with Tractomotive side boom made to order for handling pipe in the gravel beds of Wisconsin's Kettle Moraine country. Spread foreman Pete Hiner states, "You can't beat this HD-16 around these 'cavey' gravel ditches. It's got plenty of capacity to boom the pipe way out and stay far enough away from the ditch to prevent cave-ins."

Operator sold on torque converter, side boom brakes

Operator Joe Collie was high in his praise of Allis-Chalmers torque converter tractors. Collie recalled, "I've been running these A-C torque converter tractors for a long time and there just isn't anything to match them for cradling pipe. Why, on this job we hit potholes with better than 40 percent slopes. This tractor kept right on going."

Here the 57,840-lb (as illustrated) HD-16 cradles 20-inch pipe ahead of dope-wrap machine. Tractor has 77,000-lb maximum lifting capacity at 4-ft. overhang. Spread foreman Hiner stated that this machine had no downtime since the job started.

Features that make Allis-Chalmers-Tractomotive Side Boom Crawlers STAND OUT AND STAND UP

TRACTOR

Torque Converter Drive—Allis-Chalmers introduced it in crawler tractors in 1940 and now stands behind a record of outstanding torque converter performance.

Eighty-four-inch center-to-center tread width, up to 24-inch track shoes, and long track with seven heavy-duty truck wheels give this crawler tractor balance and stability to boom out the big loads.

Double-reduction final drives with straddle-mounted gears give greater ground clearance, positive alignment, longer gear life and more working strength.

Heavy-duty roller bearing truck frames and new long-life track are built to take the heavy weight, strains and stresses of side boom work.

Allis-Chalmers diesel engine with follow-through combustion burns fuel more completely . . . eliminates combustion knocks and shock loads to engine parts . . . lengthens engine life and reduces maintenance.

1,000-hour lubrication intervals for truck wheels, idlers and support rollers eliminate daily maintenance . . . put the Allis-Chalmers tractor on the job 30 minutes longer every day. Positive Seals lock out dust, dirt and moisture.

Unit construction takes the "major" out of "overhaul" . . . allows removal of engine, clutch, transmission, final drives, steering clutches independently, without disturbing adjacent assemblies.

SIDE BOOM

Convenient controls — easy-operating, positive, conveniently located.

Sure-gripping brakes—exclusive, internal expanding brakes provide positive control of load and boom line drums. Completely enclosed from dirt and moisture.

Quick-on, quick-off sectional frames —pin-connected for quick installation and removal . . . make it easy to ship or service tractor.

Husky, 18-ft box section boom—automatic clutch throw-out prevents bending of boom against boom stop.

Constant-mesh, helical gear side boom transmission—four speeds for load line and boom control; one reverse speed for power lowering.

Collie added, "I like the internal brakes on that Tractomotive side boom. If we run into heavy rains, these brakes are ready when we start up again. On other booms, I've had to run 'em 'til the water dried out."

In addition to the new HD-16, other Allis-Chalmers crawlers with Tractomotive side booms worked with the lowering-in gang and handled catch-off and hauling work.

Investigate how Allis-Chalmers dozer and side boom tractors can step up pipe footage on your job. Your Allis-Chalmers-Tractomotive dealer can give you some real performance facts

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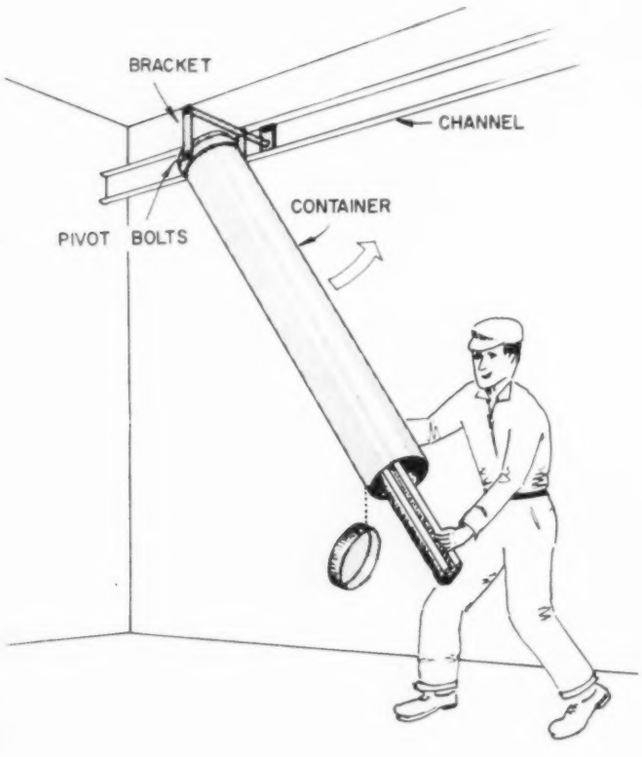
How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas



Swing Mount Makes Stretcher Accessible in Emergencies

This handy station installation makes a standard stretcher and first aid container readily accessible in emergencies.

It is fastened by a pivot on a sidewall beam so that it is high enough to allow the container to swing out about two feet off the station floor. In this position, the cap can be removed quickly and the container turned up for quick and easy removal of the stretcher and other first aid equipment.

The container at the station where this installation is in use has a small shoulder at its closed end. A metal ring is made up that will fit over the body of the container but not over this shoulder. The ring is fitted with bolts on each side which fit into bolt holes in the overhead bracket. This allows the pivoting action.

The support bracket is made of a one-half inch base plate which bolts directly to a sidewall beam. To this base is welded at right angles a 1½-inch pipe section long enough to keep the container clear of any equipment or structure on the station wall. Two ¼ by 1½-inch plates are welded to this pipe section as shown to hold the pivot bolts on the container ring.

Pressure Test Gas Line With Temporary Fitting

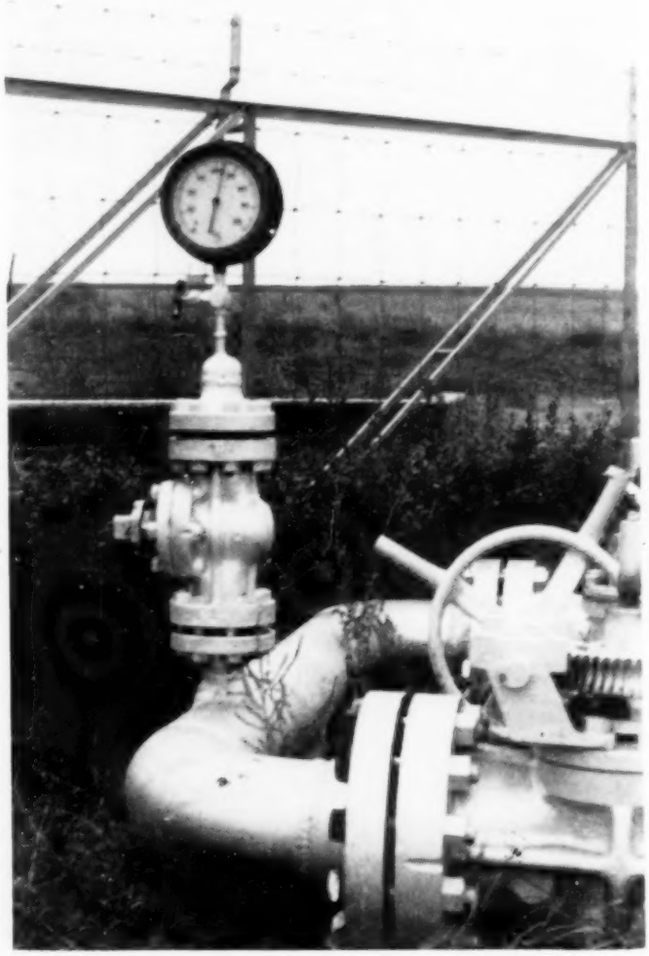
This temporary gage attachment makes possible pressure testing of gas lines where no provision for testing have been made previously. A blowdown or bleeder valve serves as the connecting link between gage and line.

To assemble the gage fittings, a semi-circular weld cap is welded to the neck of a flange fitting which mates with the upper end of the bleeder valve. A ¼-inch hole is drilled in the top of the weld cap and a ¼-inch nipple is welded to the cap at that location.

A ¼-inch needle valve and a pressure gage are attached to the upper end of the nipple in that order.

After the gage fittings have been bolted to the bleeder valve, the needle valve is closed, the bleeder valve slowly opened, the needle valve again opened and the pressure read.

The fitting assembly is disconnected easily for removal and re-use at other locations.



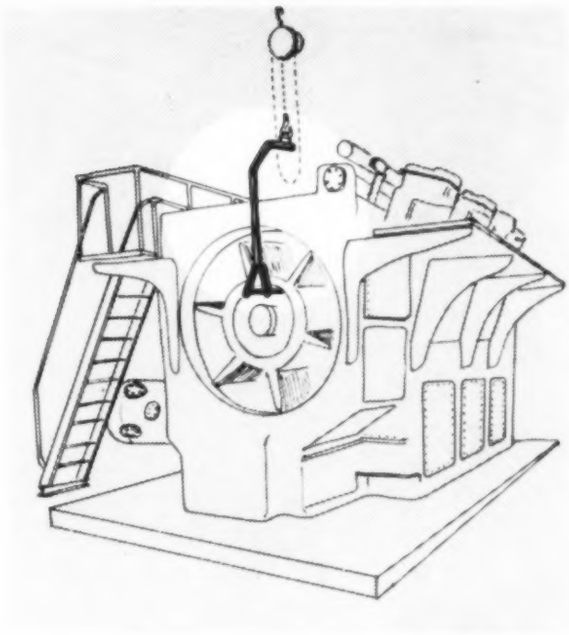
Tool Facilitates Overhaul By Speeding Blower Pulling

Pulling a blower rotor from a compressor engine can be a difficult operation without a proper tool for the job. This tool utilizes the overhead crane of the station to support the weight of the rotor while it is pulled manually from the blower housing.

Three-inch pipe, ¾-inch plate, ¼-inch plate and ¾-inch rod are the materials needed to assemble this tool. Three sections of the 3-inch pipe form the trunk and upper portion of the tool. The ¼-inch plate is used for gusset material at the weld joints of these pipe sections. The ¾-inch rod is bent into a loop and welded to the upper portion of the pipe assembly to catch the hook of the overhead crane.

The two lower legs of the tool are four sections of ¾-inch plate welded to form two hooks which can be inserted inside the rotor.

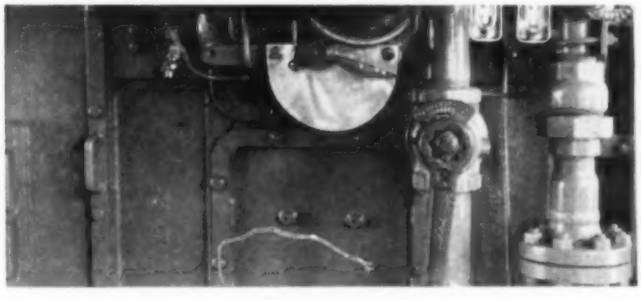
The tool is so designed that the center of gravity of the rotor lies directly below and in line with the crane, eliminating friction or strain that could occur by pulling the rotor out at an angle to its housing.



Set Engine Speed Quickly With Governor Control Knob

Station operators can change speed on all engines without waiting for a tachometer reading with this attachment to the governor linkage. A calibrated plate, a hand-knob and a pointer are the new parts needed.

The hand-knob is connected directly to the governor linkage and a tachometer reading made on the engine. Turn the knob until a reading of 250 RPM is recorded on the tachometer. This value is marked on the plate as shown and the pointer adjusted to point to that value. Then turn the knob and pointer until a tachometer reading of 240 RPM is read on the engine. This value is marked on the plate to correspond to the new position of the governor pointer. Repeat this several times over the required speed range.



Thus the engine speed is regulated by the governor control as before, but readings are recorded directly in rpm's rather than a fast-slow governor reading.

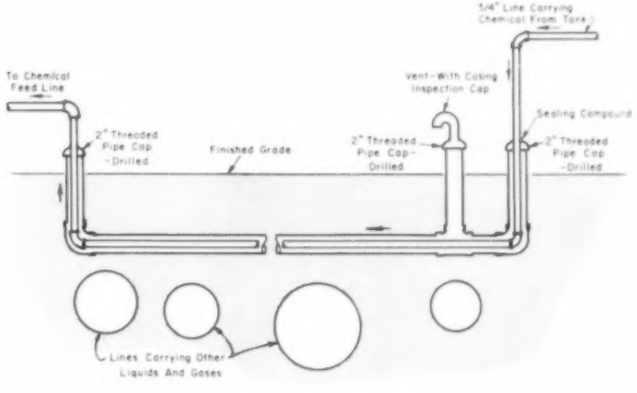
With this arrangement, the tachometer readings are only necessary at periodic intervals to check the accuracy of the governor pointer central setting.

Casing Around Acid Line Protects Pipe Lines Below

One compressor station operator devised a good method to prevent a possible leak in a sulfuric acid line from damaging crossing gas lines. He enclosed the cooling tower acid treating line in a protective pipe casing as shown.

In this way the acid line is isolated from underlying gas or oil lines. Should any leaks develop, acid is held in the casing and prevented from seeping down to the unprotected lines and causing rapid corrosion before it is detected. This system provides a vent and inspection fitting in the casing so that leaks can be readily detected when they occur.

A ¾-inch line carries acid from the tank to the cooling system. Two-inch pipe and fittings were selected to encase the acid line underground.


¾" Line Carrying Chemical From Tank
To Chemical Feed Line
Vent—With Casing Inspection Cap
Sealing Compound
2" Threaded Pipe Cap —Drilled
Finished Grade
2" Threaded Pipe Cap— Drilled
2" Threaded Pipe Cap —Drilled
Lines Carrying Other Liquids And Gases

If a leak does occur in the acid line, the acid will begin to fill the casing. Periodic inspections would reveal any build-up of acid in the casing. Leaking lines could then be repaired before any damage was done to adjacent lines.

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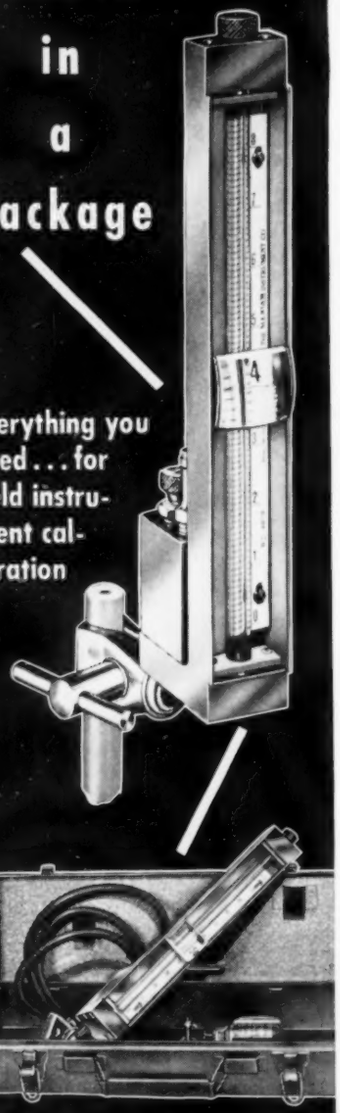

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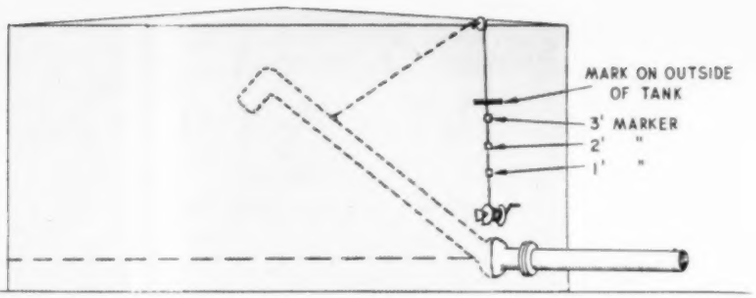


Markings Show Swing Position in Tank

On storage tanks with swing suction lines, it is often impossible to determine from the operator's position how far the swing may be lowered without picking up basic sediment and water. A simple tank marking and the attachments shown remove all doubt.

First determine the highest expected level of bs&w in the tank and lower the swing to one foot above this surface. An arrow or similar marking is painted on the outside of the tank adjacent to the swing line. At the same level as the arrow, a brass clamp about ⅜-inch wide is attached to the swing line. This clamp is stencilled "1 foot."

The swing is then raised another foot above the bs&w. Another clamp is attached to the swing line, this time at the new position that lines up with the arrow. This clamp is marked "2 feet." A third clamp marker may also be added to indicate the 3-foot mark.

With this arrangement, the man at the winch knows at all times how far the swing's mouth is from the bs&w.

Use Section of Pipe To Make Concrete Form

Pouring rounded corners of slabs and walkways around the station is simplified with this steel form made from a big inch pipe section. A foot long section of 36-inch pipe is cut into quarters and steel flanges welded to each end as shown. A wooden stake is used to hold the pipe section in line with the other forms.

After the concrete is set, the form may be removed and used at other locations.

Concrete Steps Provide Safer Pipe Crossing

Where compressor station walkways have to cross over big-inch pipe lines, the concrete steps shown save walking and lessen possibilities of injury when carrying objects.

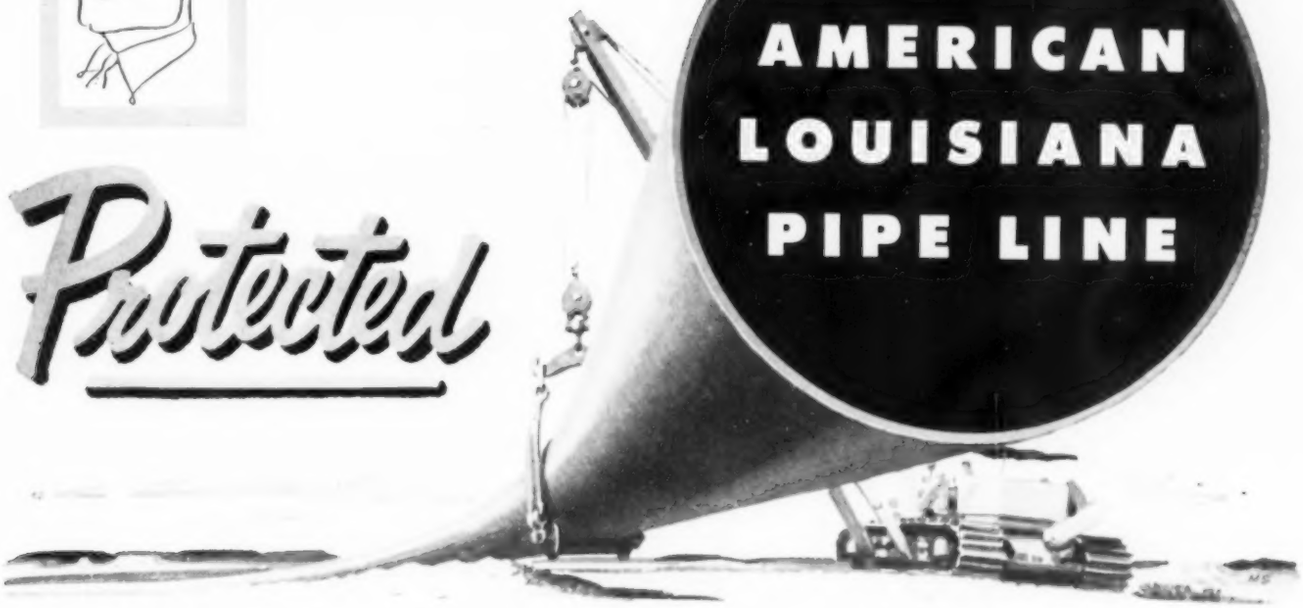
The walkway and handrail are made from steel grating and one-inch pipe stock bent and welded as shown.

There had been instances of injury to men at this and similar locations. This arrangements has eliminated that danger and been a real time saver. It improves station appearance too, for a very low cost of material and labor.

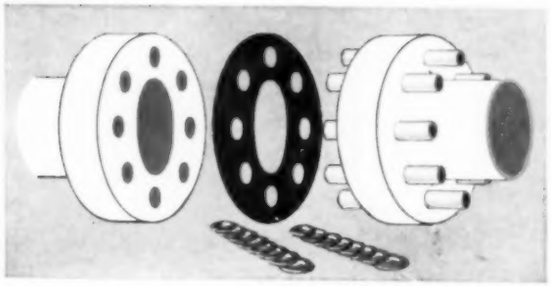
"Something from the Irishman"

AMERICAN LOUISIANA PIPE LINE

Protected



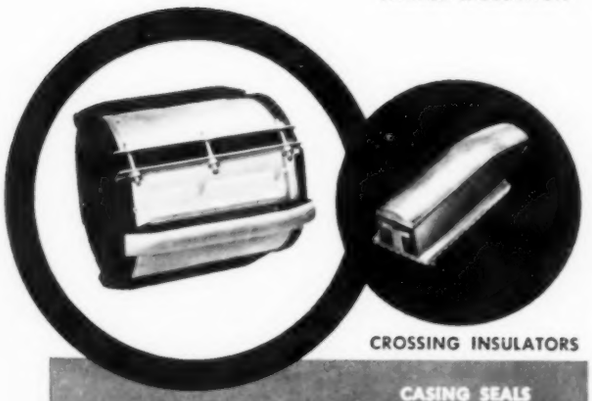
with Maloney Insulators and Casing Seals
flange insulation, scraper cups & segmental rings



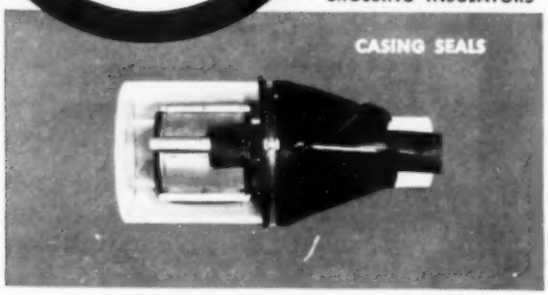
FLANGE INSULATION

SCRAPER CUPS

GRAPHITIZED MICARTA SEGMENTAL RINGS FOR COMPRESSORS



CROSSING INSULATORS



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Houston, Texas

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HIGH TEMPERATURE LUBRICANT
and L-X
FUEL AND OIL SUPPLEMENT

Because LE lubricants give results — not promises, they are the pipeliner's pick for superior lubrication. LE's fast-growing reputation for top-notch on the job performance is the talk of the pipeline industry.

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HIGH TEMPERATURE LUBRICANT

Built to "take it" on tough pipeline jobs! Scientifically manufactured from carefully selected high quality ingredients and blending oils. LE 1020 "stays put" and protects expensive pipeline equipment. High temperature, pressure and rock-crushing vibration often mean "sudden death" to ordinary greases— but for the lubricant that will outlast and outperform— pick LE 1020.

L-X
FUEL AND OIL SUPPLEMENT

Here's the only fuel and oil supplement engineered for heavy duty engines. Penetrating the pores of the metal, L-X cleans deposits of gum, carbon, varnish and lacquer from valves and rings. Its use means fewer break-downs and repairs— plus more pep and power. Use L-X in your pipeline power units!

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"FULL SPEED AHEAD"
PIPELINERS PICK LE.

For further information on this or other LE lubricants, write, wire or phone

INDUSTRIAL LUBRICANTS
FOR INDUSTRIAL EQUIPMENT
LUBRICATION
ENGINEERS, INC.
FORT WORTH, TEXAS

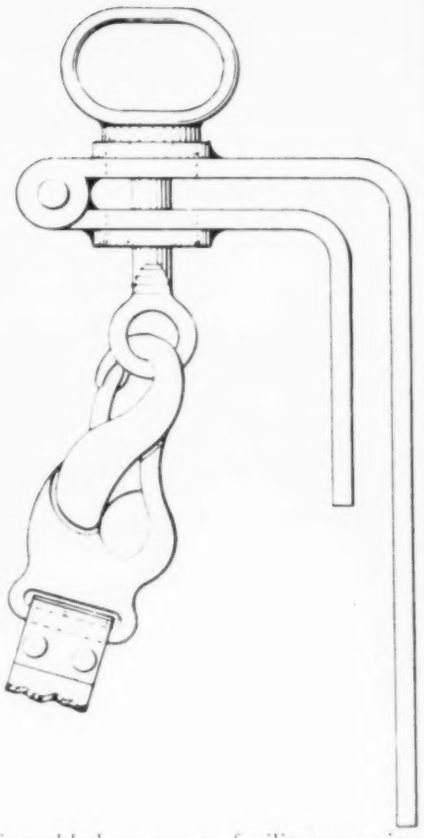
Sky Hook Gives Worker Added Mobility on Tank

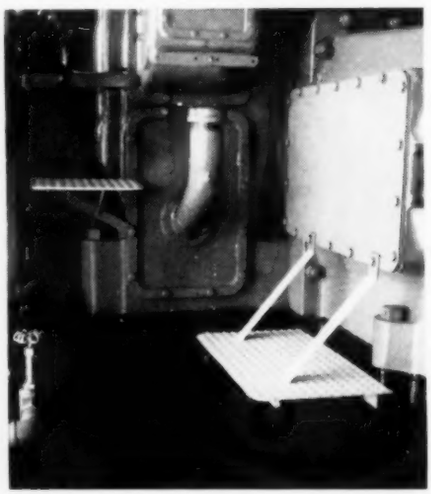
This neat device was invented by a safety engineer in California to give men more mobility with safety when working on top of a tank. Formerly they tied themselves to a C-clamp fastened to the tank. This meant they could work in an area only as large as the attaching rope allowed. When ready to work on another part of the tank top, they had to unfasten the C-clamp and move it to a new location.

This device eliminates the need to unfasten the connection at any time while working on the tank. It merely slides along the lip on the top of the tank wall.

It is made of two angles of ¾-inch plate hinged at one end so that they can be pinned together. An eye-bolt which screws into internally threaded holes in both angles near the hinge holds the hinged assembly in its fixed clamping position. Small plates are welded to the outside of the angle to give greater grip to the eye-bolt.

A handle, made from ½-inch rod, is welded on top to facilitate moving the device along the tank lip.



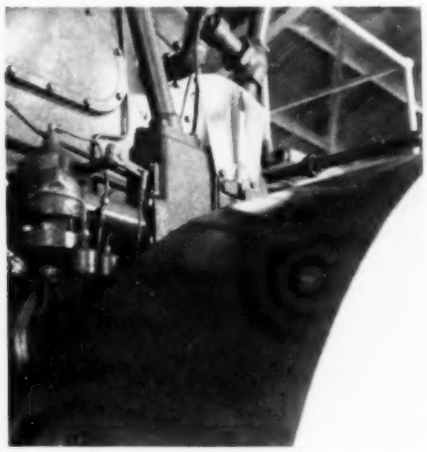


Steel Step Platforms Aid Maintenance Crews

By attaching step platforms of steel non-skid plates at convenient locations around the compressor engine, overhaul work is quickened. Dangers of using a portable ladder are eliminated. The steps shown are positioned to help the station operator get to the engine lubricators and the governor.

Modified Load Indicator Gives Closer Readings

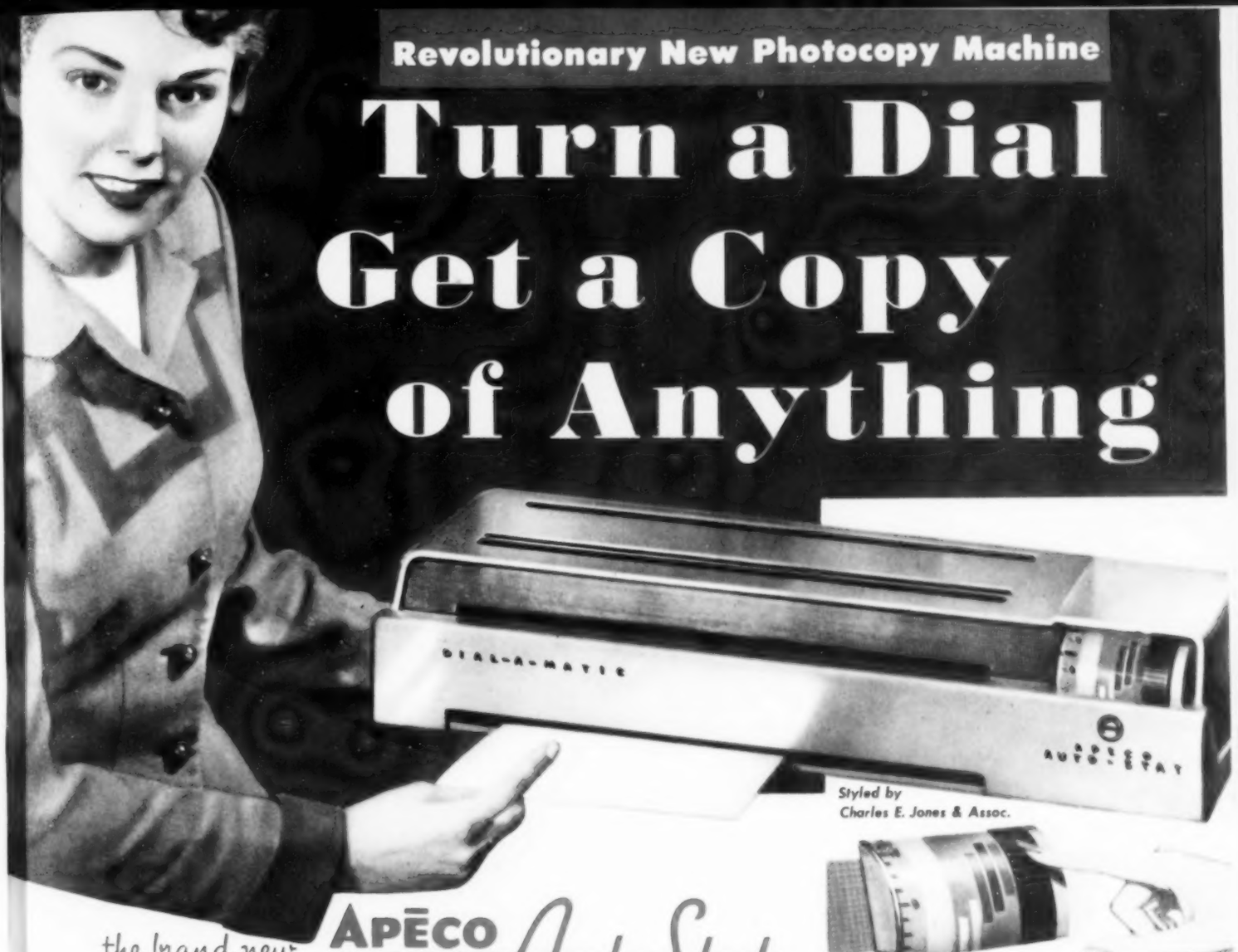
By bolting this steel plate over the engine loading gage and replacing the old indicator with a longer arm, engine loading readings may be taken more accurately than was possible before on the small pointer and calibrated plate arrangement.



This arrangement permits the station operator to check the reading from the floor level. He no longer has to climb up the side of the engine to obtain a better view of the small indicator.

Revolutionary New Photocopy Machine

Turn a Dial Get a Copy of Anything



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Now Get instant photocopies of anything written, printed, typed, drawn or photographed right in your own office.

Turn the dial . . . get the clearest, fastest most convenient copy of anything. It's the new all electric Apeco Dial-A-Matic Auto-Stat with revolutionary finger tip dial control. It's light weight for easy portability . . . compact to fit on the corner of any desk and is styled in polished and satin finish stainless steel. It copies any original up to 15" wide, any length or color on opaque or transparent paper—printed on one or both sides. The Apeco Dial-A-Matic Auto-Stat offers hundreds of money and time saving uses at a price well within the budget of even the smallest firm.

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Pipe Line Men

IN THE NEWS

G. G. Hughes, Jr.

W. T. Corley

George G. Hughes has been named chief engineer for **Interstate Oil Pipe Line Company** replacing **Sam Phelps,** who accepted a loan assignment with Esso AG as pipe line advisor, responsible for the design and construction of a pipe line from the North Sea to the Ruhr Valley in West Germany. Other Interstate appointments include **Wayne Corley** as assistant chief engineer replacing Hughes; and **C. J. (Pete) Hale, Jr.,** as operations engineer replacing Corley.

C. J. Hale, Jr.

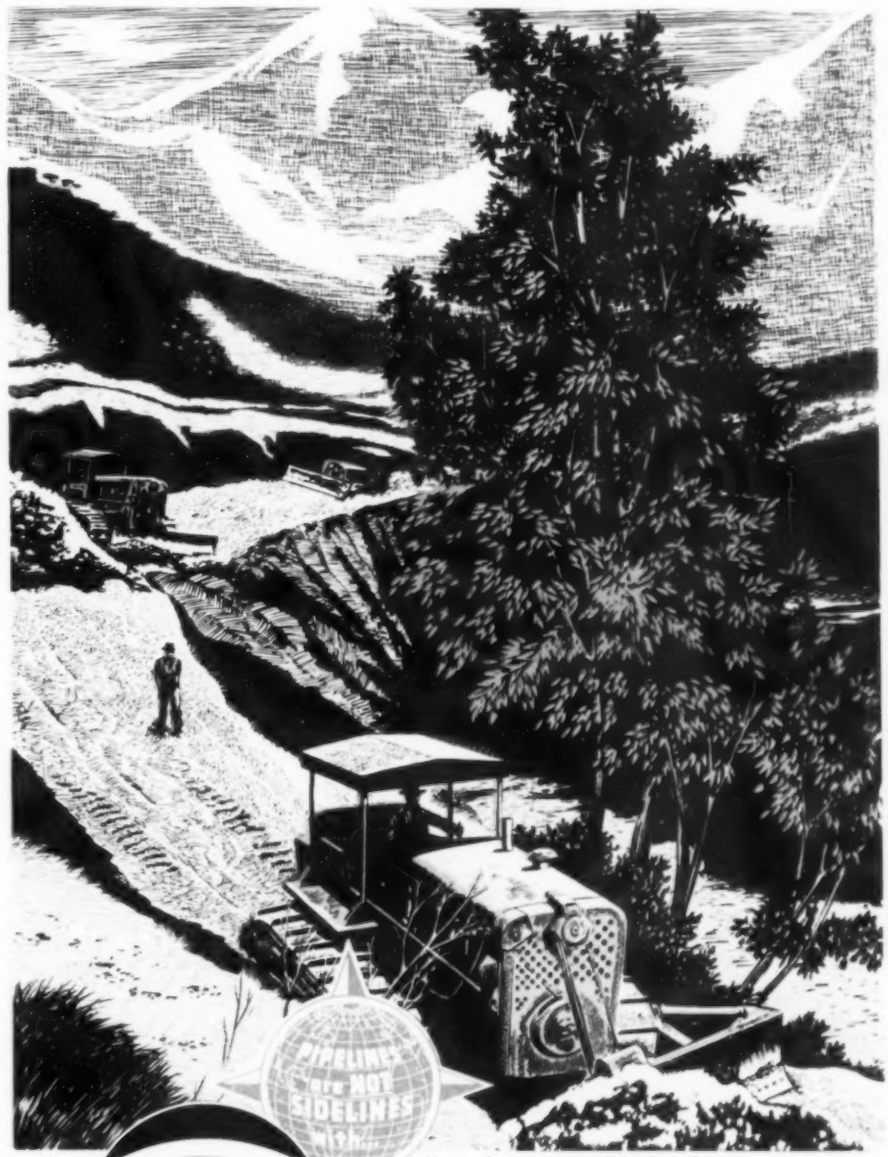
Hughes joined The Carter Oil Company in 1939 and later transferred to the geophysical department of Standard Oil Company of Louisiana, returning to Carter the same year. After military service he joined Interstate as senior engineer, progressed to division engineer and then chief engineer. Corley, who joined Interstate in 1946, has been district engineer, operations engineer, and served temporarily as assistant chief engineer and section head—technical service. Hale came to work for Interstate in 1947 and since that time has served as valuation engineer and operations engineer. In the past year he has served temporarily as section head—general engineering.

•

Personnel changes involving five employes have been announced by **Shell Pipe Line Corporation. J. E. Green,** assistant area manager, Mid-Continent area, is transferred to the head office to handle special assignments in the president's office. **R. V. Lahr,** manager, Operations Planning department, Head Office, has gone to Maracaibo, Venezuela, on loan to Compania Shell de Venezuela to serve as construction superintendent in the PAGline project. **A. H. Hall,** engineer, Operations Planning department, Head Office, will be acting manager while Lahr is on loan. **S. B. Bean,** Wasson-Hobbs division superintendent, West Texas area, will become superintendent of the Bayou division and **W. H. Craddock** will take over Bean's former duties.

•

J. J. Willenburg, Galesburg, Ill., has been appointed manager of the Missouri and Illinois divisions of the **Service Pipe Line Company.** Willen-



Now under construction: West Coast Transmission Line

WILLIAMS BROTHERS

ENGINEERS and CONSTRUCTORS

NBT BLDG. • TULSA, OKLAHOMA • CABLE ADDRESS: WILLBROS

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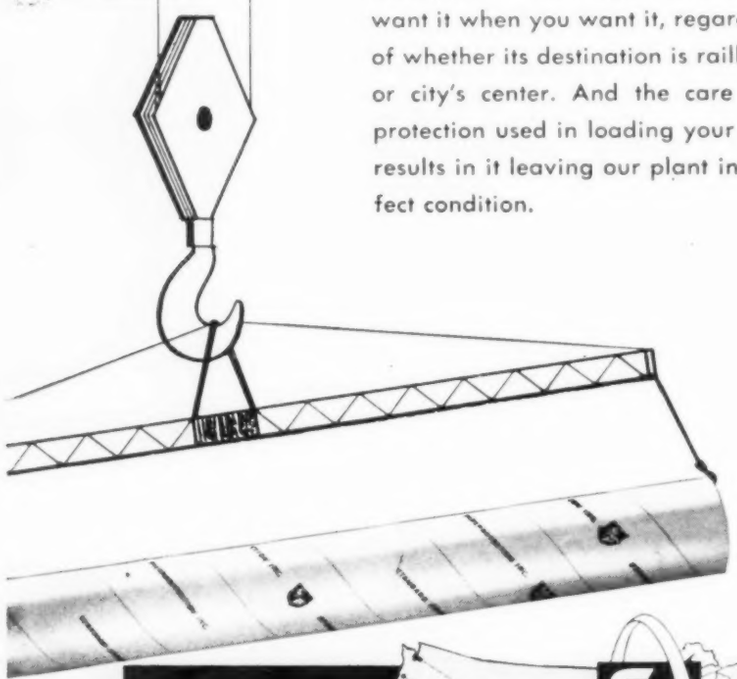
For more data on advertised products, use Readers' Service Cards, last page.

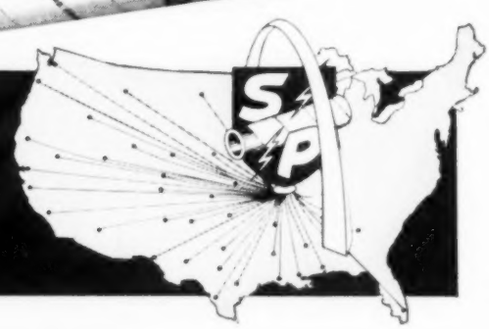
DEPENDABLE DELIVERY

You can count on SPI to give the same close attention to your delivery schedules that they give to the specifications and procedures that result in your receiving the finest coated and wrapped pipe.

Your pipe will be shipped where you want it when you want it, regardless of whether its destination is railhead or city's center. And the care and protection used in loading your pipe results in it leaving our plant in perfect condition.



THROUGH FREIGHT RATES AT THE ST. LOUIS GATEWAY



standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

burg has been manager of the Illinois division with headquarters at Galesburg. Upon the retirement of **H. C. Jones,** Raytown, Mo., former manager of the Missouri division, Willenburg assumes direction of both divisions. To assist Willenburg, **G. L. Maciula,** Galesburg, assistant manager of the Illinois division, will be transferred to Raytown to assume the supervision of the Missouri division.

•

H. D. (Deep) Henderson has joined **Trunkline Gas Company,** Houston, as manager of production and supply. He will supervise the company's Gas Supply, Gas Reserves and Geological departments and will direct the organization of a Production department. Henderson, with 30 years of service in gas and oil exploration and production, has been associated with Sohio Petroleum Company for the past ten years. Henderson entered the oil business in 1926 when he joined Sands Petroleum Company, Okmulgee, Okla. He subsequently worked for White Eagle Oil & Refining Company and Skelly Oil Company in Texas, Oklahoma and Arkansas. From 1930 to 1946 he worked for Continental Oil Company.

H. D. Henderson

•

J. L. Irvin

Walter L. Shannon

J. L. Irvin has been named general manager of the Domestic Pipe Line department for the **Gulf Oil Companies,** and **Walter L. Shannon** has been named manager of Domestic Pipe Line Operations. Both will continue to maintain their offices in Houston. Irvin will report to **R. D. McGranahan,** vice president in charge of transportation. Irvin, who started with the company in 1917, became assistant chief engineer of the Pipe Line department in Houston in

Youngstown's "big 5"

HELP MAKE ANY OIL OR GAS LINE INSTALLATION EASIER, QUICKER, LOWER IN COST

Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
2. Wall thickness is uniform
3. Line up characteristics are excellent
4. Weldability is outstanding
5. Long lengths save you time and trouble

Why does the welder like to work with Youngstown Electric Weld Line Pipe? The answer is apparent! Youngstown Electric Weld Line Pipe is designed for easy welding The same physical and chemical characteristics that make for perfection in welding at the mill also contribute to efficient, dependable welding in the field. Freedom from delays in welding, speed up installation of the pipe line—reduces contractors' costs.

Youngstown

ELECTRIC WELD LINE PIPE

QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices - - - Youngstown 1, Ohio.

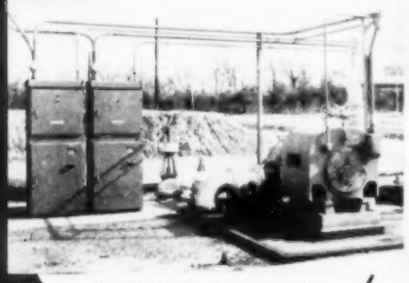
For more data on advertised products, use Readers' Service Cards, last page.

2200-5000 Volts

OIL MEN Specify:

EC&M

50,000 KVA Interrupting Capacity MOTOR STARTERS



Diesel-Loading pumps with EC&M Div. 2 Starters.

OUTSTANDING ADVANTAGES

1. Reduced floor space
2. Low-cost Div. 2 design
3. 50,000 KVA interrupting capacity
4. Combination starter with Disconnect Switches
5. Corrosion resistant, weather-proof construction
6. Copper tungsten contacts for positive operation
7. Simple 3-wire TIME-DELAY UVP push button circuit
8. THERMAL-MAGNETIC Overload Relays give accurate motor protection . . . trip instantly on faults
9. All internal wiring complete
10. Self-contained bus and pot-heads are optional

6723

Petroleum engineers specify these Starters for Division 2 semi-hazardous locations because they assure substantial savings in installation and operation.

Construction advantages include: Type III weather-resisting enclosure with drip-proof roof, tank-cover and front-cubicle doors . . . oil switch which opens 220-volt control transformer before upper door can be opened to operate main line disconnects . . . overload and control relays in flanged (Class I, Group D) enclosure with removable cover . . . main contactor with alloy contacts oil-immersed in rear tank. On voltage dips, push button circuit maintained up to 2 seconds by simple 3-wire circuit. "Stop circuit" opens without delay when 'Off button' is pressed.

EC&M 2200-5000 volt Starters are also available in Totally Oil-immersed Division 2 Style and in Division I style. Both are available with Oil Disconnect Switch (for main line).

Write for 16-page Booklet 1062 for complete details.

SQUARE D COMPANY

EC&M DIVISION • CLEVELAND 28, OHIO

1924. He has supervised the construction and operation of such pipe lines as the West Texas Gulf Pipe Line, the Canadian Gulf Pipe Line and "Project Five" Pipe Line. Shannon, who started with the company in 1920 as a laborer has since that time filled many positions with the company including chief gauger, chief dispatcher, chief superintendent of the Houston division, manager of the Southern division and manager of Domestic Pipe Line Operations.

•

Thomas T. Arden was elected president of the **Pacific Coast Gas Association** at the 63rd annual convention held at Coronado, Calif. Arden who succeeds Guy W. Wadsworth, Jr., is executive vice president of Robertshaw-Fulton Controls Company. He has been vice president, director and chairman of the manufacturers section of the PCGA. Wadsworth, president of Southern Counties Gas Company, will serve as a member of the board of directors. Also elected were **C. H. Gueffroy,** president of Portland Gas & Coke Company, vice president; and **Harry McGann,** auditor of division accounts, Pacific Gas & Electric Company, treasurer.

T. T. Arden

The new PCGA board of directors includes, in addition to Wadsworth, the following: **Harold Laub,** president, Southwest Gas Corporation, Nevada Natural Gas Pipeline Company, and Nevada Southern Gas Company; **Phillip E. Beckman,** vice president, Pacific Gas and Electric Company; **Paul H. Hammond,** vice president and controller, Holly Manufacturing Company; **Charles M. Sturkey,** executive vice president, Washington Natural Gas Corporation; **Grove Lawrence,** vice president, Southern California Gas Company; **Dr. H. L. Purdy,** executive vice president, British Columbia Electric Company; **J. D. Roberts,** vice president, Mountain Fuel Supply Company; and **C. H. Webber,** vice president, Tucson Gas, Electric Light and Power Company. Hammond also will serve as chairman of the association's manufacturers section.

Installation of officers marked the end of the 32-year tenure of **Clifford**

A CAT* TWIN ARC-WELDER JOINS THE FIRING LINE

for Oklahoma Pipe Line Constructors

Oklahoma Pipe Line Constructors put its new Caterpillar D315 Twin Arc-Welder to work immediately on a 24″ line it is laying for Tennessee Gas and Transmission Co. into the northeastern states.

The great new arc-welder—which combines a powerful Cat D315 Engine with two welding generators mounted in one generator frame—is mounted on an Athey crawler pulled by a D6. Reports Superintendent N. L. Arie:

"We like Caterpillar equipment because we have found it best over the years. Cat-built equipment takes more rough treatment in tough places than any other."

And the new twin arc-welder is no exception. It is heavy-duty power in a compact package—easily transported over rugged terrain. The unit is only 30″ wide and 10′ long. Each of the two generators has an output of 300 amperes, but when extra-heavy current is required, they are paralleled to produce 600 amperes. Independent controls allow operators to weld at different voltages at the same time.

Welders like the smooth arc with its excellent metal flow. And you can be sure your firing line will keep up with the pipe. This 4-cycle diesel picks up the load instantly without missing.

Here's a way to cut transportation and maintenance costs and conserve manpower. You'll start saving money the day you begin using the new twin arc-welder on your spread. For complete details, see your nearby Caterpillar Dealer soon.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

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MODERN HEAVY-DUTY PIPELINE WELDERS

Johnstone, PCGA managing director. Johnstone, who is retiring, is being succeeded by **R. D. Scott,** formerly vice president of the Honolulu Gas Company.

•

Ray T. Scott, division superintendent at Chicago for **Standard Oil Company (Indiana)** products pipe lines operations, has retired and **Spencer A. Hallberg** appointed to succeed Scott. As Chicago division superintendent since 1954, Scott has been responsible for the operations and maintenance of the company's products pipe line facilities extending from Whiting, Ind., to Detroit, Mich., from Whiting to Indianapolis, Ind., and from Whiting to Dubuque, Iowa. Scott joined Standard Oil in 1921. Hallberg, who joined Standard Oil in 1946 as an assistant products pipe line dispatching supervisor, became dispatching supervisor a year later. In 1949 he was appointed supervisor of scheduling and dispatching. He advanced to superintendent of the projects and materials division in 1952 and division superintendent of the company's Twin Cities, Minn., products pipe line operations in 1954.

Rolland Wages

M. A. Wilson

Northern Natural Gas Company has announced the appointment of **Rolland Wages** to fill a newly-created post of traffic supervisor in the Purchasing department. Wages, who has more than 12 years experience in traffic supervision, was with the Nebraska Railway Commission before joining Northern. **Marvin A. Wilson, Jr.,** has joined Northern Natural as assistant to the manager of gas purchases. Before joining Northern, Wilson was superintendent of Natural Gas Sales for Cities Service Oil Company.

•

Roger D. Stanwood has been elected vice president—gas supply of **Transcontinental Gas Pipe Line Corporation.** Stanwood spent 11 years with Tide Water Associated Oil Company, progressing from roustabout to assistant superintendent of gas utilization. Stanwood joined Transco in 1951 as assistant to the vice president in charge of gas supply. He has been actively engaged in the negotiation of gas purchase contracts for Transco and also in the work of Transcontinental Production Company.

Roger D. Stanwood

•

Alan R. Bailey has been appointed senior vice president of **Southern Counties Gas Company.** Currently Bailey is assistant to the president of Pacific Gas & Electric Company, San Francisco, and was vice president in charge of operations of Coast Counties Gas and Electric Company until 1954 when the latter was merged with Pacific Gas and Electric. Bailey joined **Coast Counties** in 1930 as gas engineer and subsequently became general gas superintendent, assistant to the president and then vice president.

A BRADEN WINCH

and a Crane

make difficult handling jobs

easy

BRADEN Truck Winches turn difficult handling jobs into easy ones. Whether used by themselves, with gin pole or crane, an operator can keep heavy loads under perfect control with complete safety.

Specify BRADEN Winches for your trucks . . . for the utmost in dependability.

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Supervision
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CATHODIC
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Working in cooperation with engineering departments, Topaz sales engineers perform flow condition analyses, hot tapping, pigging, stopple application, inspecting and line testing.

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At your service...

Night and day...offering finest quality pipeline supplies and equipment

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Valves • Clamps, hooks & dollies • Heavy machines
Pipe cutting machines • Cutting & beveling machines
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For more data on advertised products, use Readers' Service Cards, last page.

Howard M. Temple

C. H. Calvert, Jr.

Howard M. Temple has been named secretary and **C. H. Calvert, Jr.**, appointed production manager of **Commonwealth Oil Company** of Houston. Both men will serve in similar capacities in the **Marine Gathering Company**, a Commonwealth subsidiary, which also is expanding its drilling activities. Temple formerly was legal adviser to Pan American Production Company and was with Hunt Oil Company, Dallas. Calvert was assistant division superintendent in the Houston office of D. D. Feldman Oil and Gas Company.

R. C. Ledford, vice president of Marine Gathering Company, has been elected president of the Pipe Liners Club of Houston for 1956-57. **Raymond Crow,** Transcontinental Gas Pipe Line Company, was named vice president; **R. E. Schuhmann,** Trunkline Gas Company, secretary, and **Wilbur Moore,** treasurer. Three new directors are **Henry Johns,** Gulf Refining Company's Pipe Line department; **Donald M. Taylor,** "The Petroleum Engineer"; and **Clem Richardson,** Transcontinental Gas Pipe Line Company.

•

Dr. George S. Hume, director general of Scientific Services, Department of Mines, Ottawa, is joining **Westcoast Transmission Company Limited** as vice president and chief geologist. Hume has been prominent in the development of Canada's natural gas reserves and the establishment of natural gas pipe lines for service to all parts of Canada.

•

Robert C. Ledford, operations manager for **Marine Gathering Company** of Houston, has been elected vice president. Ledford has more than 20 years experience in the design and construction of chemical and gasoline plants and gas gathering systems. Before joining Marine Gathering Company in 1950, Ledford was construction superintendent of the McCarthy Chemical Company at Winnie. He also was formerly employed in the Refining Engineering department of Phillips Petroleum Company and was chief engineer of Barber Asphalt Company.

Robert C. Ledford

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BUTTONED UP JOB

ONE CALL to Williams and you can forget about testing. Our complete mobile equipment, experienced testing engineers, and 24-hour crews handle the entire testing procedure from preliminary engineering to making final reports.

Developed by Williams, this packaged service has been used by major pipeline companies on some of the longest and largest lines in the country.

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PRESSURE SERVICE COMPANY

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October

American Institute of Electrical Engineers
Morrison Hotel, Chicago, Oct. 1-5.

Texas Mid-Continent Oil & Gas Association
Rice Hotel, Houston, Oct. 2-3.

For more data on advertised products, use Readers' Service Cards, last page.

This Link-Belt Speeder LS-98 with a 1-yd hoe totalled over 250 miles of cross country travel on a big pipelining spread. Its Independent Swing and Travel feature often saved as much as an hour a day.

In every size, Link-Belt Speeder shovel-cranes offer

more speed, stamina, power and work-time!

More speed — Speed-o-Matic, the true power-hydraulic control — smooth, positive response — perfect "feel" for speed with accuracy. Engineered to consider the human factor, greatly reduces operator fatigue.

More power — Get more line pull, digging power, lower fuel costs. Link-Belt Speeder design calls for precision-machined anti-friction bearings and splined shafts at every point that transmits *rated* horsepower into *usable* horsepower.

More stamina — A Link-Belt Speeder withstands continuous heavy-duty, high-speed operation. For proof, compare similar sized rigs with and without counterweights. Link-Belt Speeders have more "live weight", more strength built into every component.

More work-time — A bigger percentage of shift is spent in actual "work-time." By minimizing operator fatigue, Speed-o-Matic boosts output up to 25%; also eliminates frequent on-the-job clutch adjustments and maintenance.

CHECK THESE BRIEF SPECIFICATIONS

Model	58 Series* Models	68 Series* Models	88 Series* Models	98 Series* Models	108 Series Models**	K-300 Series Models	K-608 Series Models
SHOVEL RATINGS (Cubic yards)	½	¾	¾	1	—	1½-1¾	3
DRAGLINE AND CLAMSHELL Standard Boom Length (ft.)	30	30	35	40	40	50	60
Rating (cu. yds.)	½	¾	¾	1¼	—	1½-2	3
LIFTING CRANE Standard Boom Length (ft.)	30	30	35	40	40	50	60
Min. Radius (ft.)	10	10	10	10	10	12	12
Safe Rating at Min. Radius (tons)	8.2-12.5	11.2-17.5	16-25	22-30	35	26.6-36.6	68.4-74.5□

*Series includes crawler, truck and wheel-mounted self-propelled model.
**Truck-mounted only.
□For comparative rating purposes.

The "super" on this job said, "We asked this rig to swing more pipe than any other rig had before. It came through with flying colors."

13-749-A

You're ahead on every job—

because Link-Belt Speeder is *years ahead* of the shovel-crane industry. Only Link-Belt Speeder offers you Speed-o-Matic's true power hydraulic control and so many other outstanding design and construction advantages. For facts on every machine in the ½ to 3-yard, 8 to 75-ton work range, contact your Link-Belt Speeder distributor. Link-Belt Speeder Corp., Cedar Rapids, Ia.

LINK-BELT SPEEDER

Factory-trained distributor sales and service specialists everywhere

American Society of Mechanical Engineers and American Society of Lubrication Engineers, Lubrication Conference, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 8-10.

Gas Measurement Institute, University of Kansas and Southwest Kansas Petroleum Industry, 4-H Building, Liberal, Kansas, Oct. 9-10.

Oil Progress Week, Oct. 14-20.

AGA Annual Meeting, Atlantic City, N. J., Oct. 15-17.

American Society of Civil Engineers, Pipe Line Division, William Penn Hotel, Pittsburgh, Oct. 15-19.

American Institute of Mining, Metallurgical and Petroleum Engineers, Petroleum Branch, Biltmore Hotel, Los Angeles, Oct. 15-17.

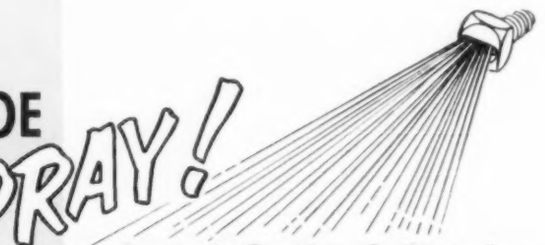
American Society of Civil Engineers, Annual Convention, William Penn Hotel, Pittsburgh, Oct. 15-19.

Rocky Mountain Oil & Gas Association, Annual Convention, Cosmopolitan Hotel, Denver, Oct. 22-24.

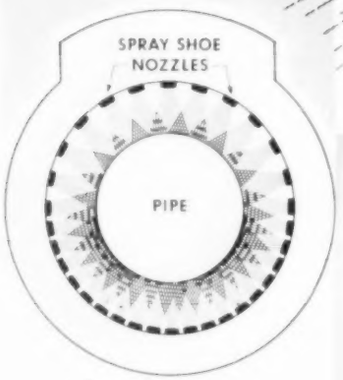
National Safety Council, Chicago, Oct. 22-26.

American Society of Safety Engineers, Annual Meeting, Conrad Hilton Hotel, Chicago, Oct. 23.

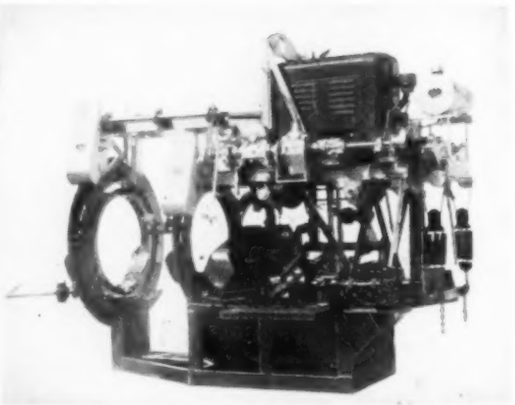
A SPRAY SHOE Should SPRAY!



Perrault Coating & Wrapping Machines Have Exclusive NOZZLE-FITTED SPRAY SHOE



Spray shoe cross section shows how spray nozzles give DOUBLE dope coverage on pipe top, TRIPLE coverage on pipe bottom . . . Insurance for a better coating job.



DOUBLE-COAT, DOUBLE-WRAP MACHINE

PERRAULT COATING AND WRAPPING MACHINES for large pipe sizes are more dependable. They have less downtime because, when compared to the industry, they are designed with: More power, heavier transmissions, bigger clutches, stronger speed reducers, greater pumping capacity, full-width rubber crawlers. Even with these better components Perrault units are lighter in weight. Other models available for all pipe sizes; any coat and wrap combination. Call Perrault for complete details.

ALSO CARRIED IN STOCK: Pneumatic Inside Line-up Clamps — sizes 20 to 36 in. Cleaning and Priming Machines — line traveling or stationary. Glass Pipe Wrap, Asbestos Felt Wrap, Kraft Wrap, and Rock Shield. Tar-Heating Kettles, Burners, Patch Pots and Accessories.
Pneumatic-Tired Lowering-In Cradles, Adjustable Pipe Cradles, Five-roller Cradles, Tongs, Hooks, Blocks, Belts, Slings, Line-up Clamps, Hand Tools, Supplies and Equipment of every sort.

PERRAULT EQUIPMENT COMPANY
1130 N. BOSTON — TULSA, OKLA. — TELEPHONE LUther 5-1103

NACE, South Central Region, Gunter Hotel, San Antonio, Texas, Oct. 23-25.

Independent Petroleum Association of America, Annual Membership, Mayo Hotel, Tulsa, Oct. 25-26.

SGA Roundtable on Engine Ring Use of Electronic Computers, Shamrock Hotel, Houston, Oct. 26.

November

American Petroleum Institute, Annual Convention, Conrad Hilton Hotel, Chicago, Nov. 12-15.

NACE, Western Regional Division Conference, Lafayette Hotel, Long Beach, Calif., Nov. 15-16.

American Society of Mechanical Engineers, Statler Hotel, New York, Nov. 25-30.

January

Pipe Line Contractors Association, Ninth Annual Convention, Boca Raton Hotel and Club, Boca Raton, Fla., Jan. 14-16, 1957.

American Institute of Electrical Engineers, 1957 Winter General Meeting, Hotel Statler, New York, Jan. 21-25.

February

NACE, Tulsa Section, Corrosion Short Course, Mayo Hotel, Tulsa, Okla., Feb. 13-15.

March

NACE, 13th Annual Conference and Exhibition, St. Louis, Mo., March 11-15, 1957.

New England Gas Association, Annual Meeting, Hotel Statler, Boston, Mass., March 21-22, 1957.

Mid West Gas Association, Hotel Nicollet, Minneapolis, March 25-27.

April

Petroleum Equipment Suppliers Association, Palm Springs, Calif., April 6-11, 1957.

AGA Distribution, Motor Vehicles and Corrosion Conference, Rice Hotel, Houston, April 8-11.

American Welding Society, Sheraton & Bellevue Stratford Hotels, Philadelphia, April 8-12.

Southwestern Gas Measurement Short Course, College of Engineering, University of Oklahoma, Norman, April 16-17.

Southern Gas Association, Annual Convention, New Orleans, April 29-May 1.

May

AGA Gas Supply, Transmission and Storage Conference, Mark Hopkins Hotel, San Francisco, May 9-10.

Measure of Service to You

You, our readers, are the most important facts in our publishing lives! Serving you is our most important function. And we value an impartial measure of how well we do serve you.

Our membership in the Audit Bureau of Circulations* brings us that measure. Once each year, an experienced A.B.C. auditor calls at our office to review and report on your new and renewal subscriptions . . . the cash ballots that you cast in our favor. That auditor examines all our books and records to develop the solid numerical facts about the circulation progress that only *your satisfaction and your liking* for our publication makes possible.

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As our editors study the audited report of our net paid circulation, tested by A.B.C.'s probing investigation, we quickly find that the cold figures tell us accurately how you, our readers, value our publishing efforts.

And so our circulation success, when measured and verified by A.B.C., helps us to bring you *a full measure of editorial value* throughout the year.

* * *

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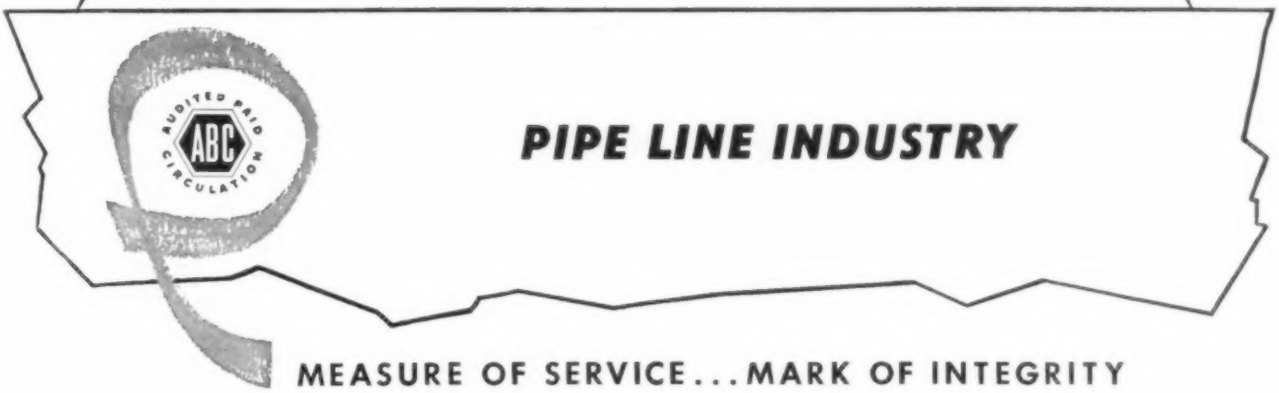


MEASURE OF SERVICE . . . MARK OF INTEGRITY

What's Happening

AMONG SERVICE AND SUPPLY MEN

E. S. McRoberts

W. W. Sentell

McRoberts, Sentell Named To New Posts at Beaird

E. S. McRoberts, who has been manager of compressor sales for the past 10 years, has been promoted to staff consultant of the general Sales department of The J. B. Beaird Company, Inc.

McRoberts will be succeeded as manager of compressor sales by W. W. Sentell, promoted from assistant manager.

Pipecote Service Corporation Elects Two New Officers

Pipecote Service Corporation has announced the election of new officers. John L. Goforth, sales manager, replaces J. C. Cooper, who resigned; and John R. Hurt, secretary-treasurer, replaces Barney F. Bedford, who resigned.

Other officers are A. C. Curtis, president; Patrick H. Downing, vice president—investments; and Luke Robinson, chairman of the board.

Dutch Subsidiary to Distribute Thew Shovel's Lorain Machines

The Thew Shovel Company, manufacturers of Lorain power shovels and cranes, has established a wholly-owned Dutch subsidiary for the manufacture and distribution of Lorain machines in Europe.

The new company is "Lorain Holland, N. V.," and is located in The Hague, Netherlands. Warren B. Weston, director of overseas operations for Thew, will be managing director of the new company. F. S. Battin, export sales manager of Thew in Lorain, will be sales manager.

Lorain Holland, N. V., has made arrangements with Holland Cranes for partial production and final assembly of certain models of Lorain line of product as an initial step in this program. Production will be underway in January, 1957.

The Lorain models produced in the Netherlands will be the current designs as built and sold in the U. S. Distribution will take place through the same network of Lorain European distributors as now exists.

Feldmann Elected to Board Of Worthington Corporation

Walther H. Feldmann, executive vice president of Worthington Corporation, has been elected a member of the board of directors of Worthington.

W. H. Feldmann

Feldmann has been associated with Worthington since 1944, and has been executive vice president since January 1, 1955. His election to the board increases the number of directors to fourteen.

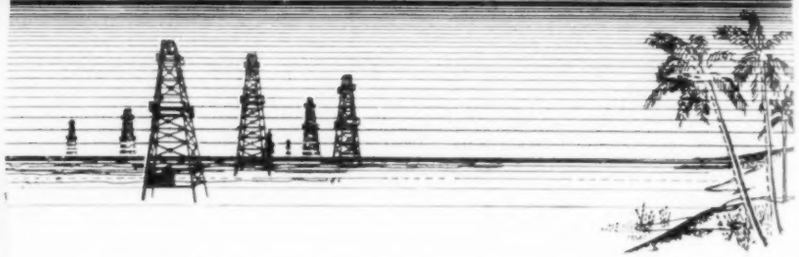
In 1922 Feldmann joined Electric Machinery Mfg. Company as Cleveland district manager. He was appointed general sales manager of the company in 1927, with headquarters in Minneapolis. He became vice president and general manager in 1940, and president and general manager in 1944.

In 1944 Worthington Corporation purchased Electric Machinery Mfg. Company, and Feldmann continued to serve as president and general manager of the company until 1950. He was then transferred

PIPE LINE TRENCHING

16 60 Model Trencher digging in hard sand

in the MIDDLE EAST



Engineers in oil-producing countries know the best machines for the job. For trenching, they specify ALLEN—a name renowned for reliability, freedom from costly breakdowns, and ease of maintenance. In hot, dusty conditions, ALLEN trenchers slog on, day in, day out, standing up to years of continuous hard work—they have no equal anywhere.

Three models are available, the 12/21, the 16/60, and the new 14 30 for medium size trenches.

ALLEN TRENCHERS

Illustrated catalogues and technical data on request.

JOHN ALLEN & SONS (OXFORD) LTD · COWLEY · OXFORD · ENGLAND

Scarcity Accents the Importance of Quality . . .

So You Have an Important Stake in J&L Research

Every man who buys or uses or is interested in the use of A.P.I. Tubular Products can observe the results of J&L research.

It is reflected in the adaptability and useful life expectancy of every length of J&L pipe, seamless or welded.

It is reflected in the excellence of the technical services of J&L Supply Men actively and enthusiastically interested in helping you get maximum dividends from your pipe investments.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

3-1

to the general offices of Worthington Corporation at Harrison, N. J., as vice president in charge of sales, and subsequently executive vice president.

Coal Tar Lining Project Completed by Pipe Linings

Pipe Linings, Inc. has recently completed one of the largest centrifugally spun coal tar lining projects attempted on large pipe.

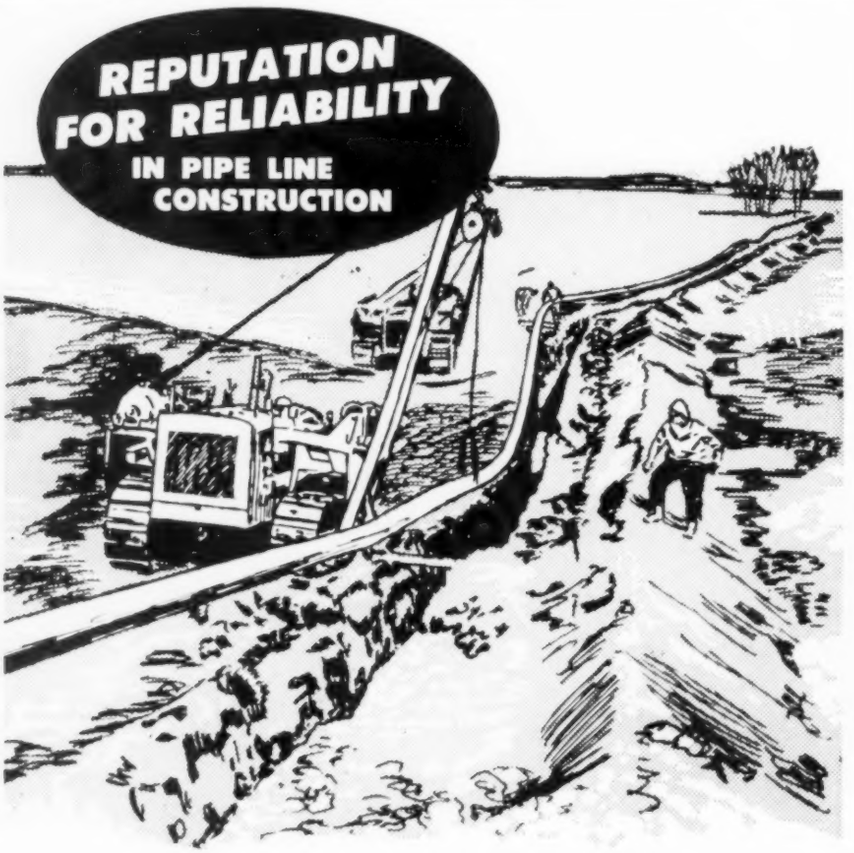
One hundred thousand interior square feet of pipe, in sizes from 84-inch to 108-inch in diameter, 40 feet in length, was given an interior coal tar coating with mirror smooth finish, using specially designed centrifugal spinning equipment. The pipe was destined for the Donnells and Beardsley Penstocks of the Tri-Dam Project in California.

Pipe Linings, Inc., engages in applying interior cement mortar lining of pipes up to 144 inches in diameter by Tate and Centriline processes, and in applying Somastic asphalt-mastic to pipe exteriors. The job of coal-tar lining for the Tri-Dam Project penstocks is the firm's first large job in this field and marks the entrance of Pipe Linings into the coal tar lining market.

New Field Representatives Named by U. S. Steel Division

James H. Rudd has been appointed as the Houma, La., field representative and Charles L. Chapman as representative at Kilgore, Texas, for U. S. Steel's Oil Well Supply division.

Rudd was employed by Oilwell in 1955 at Houma and Chapman was employed as a pump repairman at Kilgore in 1953.



There's a sense of security when a Sheehan "spread" is tending the job . . . an assurance that only the most efficient in equipment, methods and manpower is being used to complete your project *on time.*

Your project, whether large or small, will receive our immediate and reliable attention.

SHEEHAN PIPE LINE CONSTRUCTION CO. TULSA OKLA

SHEEHAN

Natl. Bank of Tulsa Bldg. • Tulsa, Oklahoma

Clark Elected Treasurer Of Thew Shovel Company

Waid V. Clark, secretary-controller of Thew Shovel Company, has been elected treasurer, a position formerly held by C. B. Smythe, now president of the company. Clark continues as director of the company.

Waid V. Clark

Clark started with Thew in 1944 as controller. Prior to that time he was assistant to the president of the Glenn L. Martin Co., assistant to the president and controller of the Cleveland Railway Company, special agent at the Guardian Trust Company and attorney at the Union Trust Co.

R. J. Clark to Represent Pritchard of California

The R. J. Clark Equipment Company, Inc. of Clearwater, Fla., has been appointed sales representative in the state of Florida by J. F. Pritchard and Company of California.

In addition to R. J. Clark, president, and Donald J. Roy, general manager, the personnel of the Clearwater office includes Elbert Linville and Furman C. Whitaker, sales engineers.

Dravo Names Hower Manager Of Engineering Construction

E. N. Hower has been appointed manager, Engineering and Construction department sales of Dravo Corporation, Pittsburgh. Hower formerly was manager of the Machinery Division's Industrial department and has been a member of the Dravo organization since 1947.

E. N. Hower

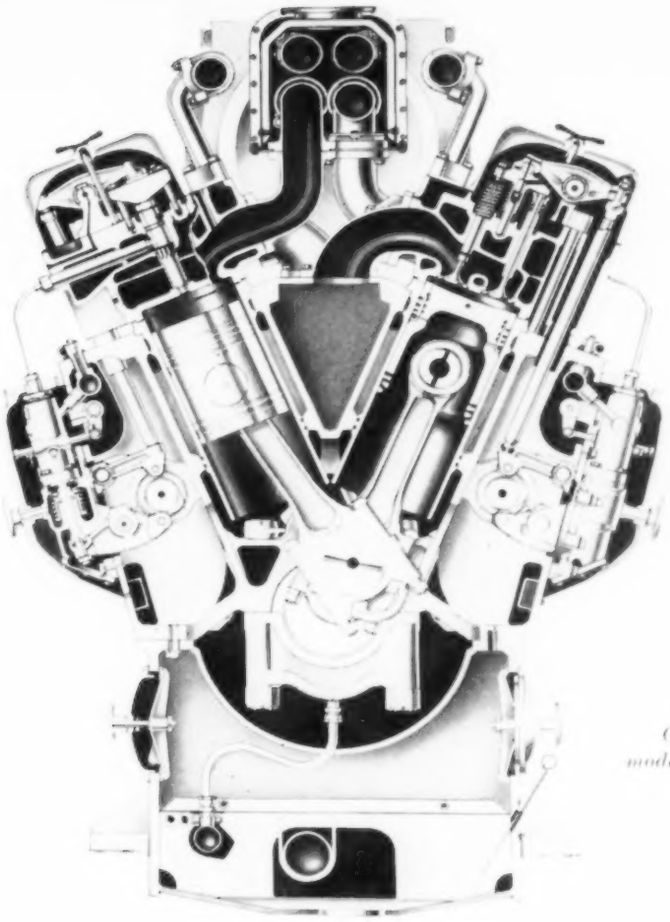
Activities of the Engineering and Construction department include construction of boiler and power plants, oil pumping and gas compressor stations, water pumping stations, sintering and pelletizing plants, mill lubrication systems and similar activities.

Fischer & Porter Names Weber European Manager

Fischer & Porter Company announces the appointment of Norbert Weber as European manager. In this newly-created position in the company's International division, Weber will coordinate engineering, production and sales of Fischer & Porter's four European manufacturing affiliates and nine engineering representatives. He will be based at Fischer-Van Winkel, N. V., The Hague, Netherlands.

Weber came to the U. S. in 1948 and has been with Beckman Instruments for the last five years, three as senior project engineer and two in charge of industrial instrument sales in the Philadelphia-Buffalo area.

For more data on advertised products, use Readers' Service Cards, last page.



Cross section of vee model ALCO *251 diesel.*

MODERN ALCO 251 DIESELS

ARE DESIGNED FOR LIGHTER WEIGHT, HIGHER POWER, LOWER COSTS

ALCO 251 diesel engines offer light weight, high power, utmost reliability — at low cost — for all stationary and marine applications. The basic 251 engine is easily adapted, by simply adding standard parts, to pipeline pumping, marine service, power generation, oil-well drilling, power "packages" and many other applications.

Available in three sizes, in-line six, vee 12 and vee 16, ALCO 251 diesels range in horsepower from 550 to 2400. All three models have interchangeable parts for easy replacement and maintenance. ALCO has located complete parts warehouses in seven cities throughout the country, and two "repair and rebuild" centers are also established.

You get better economy. Not only in low first cost from ALCO's production line, but in low operating, installation and maintenance cost the ALCO 251 diesel can mean a real economy.

ALCO 251 DIESEL ENGINE SPECIFICATIONS

No. Cyl.	Bore and Stroke (in)	RPM Range	BHP Range	Approx. Wt. Dry (lb)
6	9x10½	350-1000	550- 900	22,100
12	9x10½	350-1000	1100-1800	32,650
16	9x10½	350-1000	1470-2400	42,000

For further information about these modern, high-powered, light-weight diesels, contact your nearest ALCO sales office or write P. O. Box 1065, Schenectady 1, New York, for a new brochure giving all details.

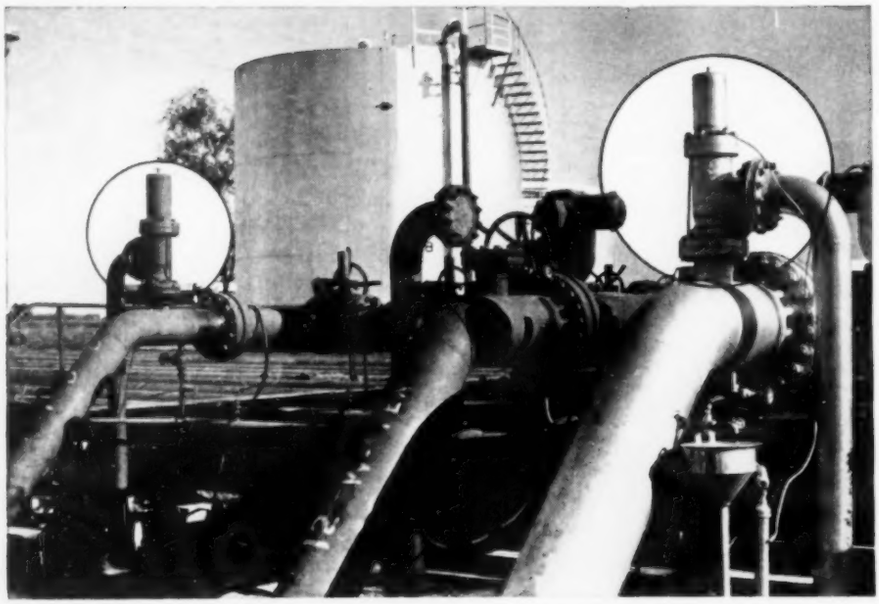
ALCO

ALCO PRODUCTS, INC.

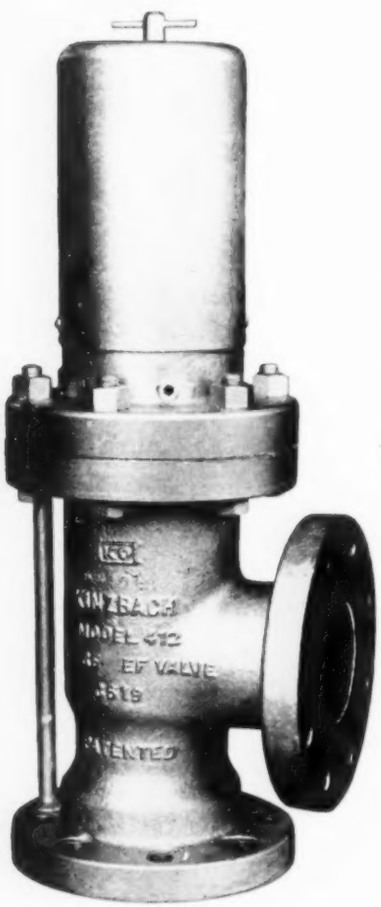
NEW YORK

Sales Offices in Principal Cities

Locomotives · Diesel Engines · Nuclear Reactors · Heat Exchangers · Springs · Steel Pipe · Forgings · Weldments · Oil-Field Equipment



Positive Protection Against Pressure Surges



KINZBACH
MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.

Walter Messner

S. E. Gewin

Bristol Appoints Managers In Chicago and St. Louis

Appointment of S. E. Gewin as district manager of The Bristol Company's Chicago office has been announced. Gewin's successor as manager of the St. Louis office will be Walter Messner.

Gewin has been with the Bristol sales organization since 1937, when he became a field engineer in the Philadelphia office. He later served in the Charleston, Pittsburgh, and Buffalo offices, before being promoted to district manager of the St. Louis office in 1953.

Messner has been regional field engineer in Tulsa, Okla. since 1943. He joined the Bristol sales force in 1940 in the New York office.

De Laval Steam Turbine Opens Sales Branch in Moline

De Laval Steam Turbine Company has announced the opening of a new sales branch office in Moline, Ill. H. A. Besocke has been appointed manager. Besocke has served in De Laval's Chicago district office since 1949.

Colorado Fuel and Iron Moves Warehouse to Larger Quarters

The Colorado Fuel and Iron Corporation has moved its Philadelphia district warehouse and sales office to larger headquarters.

Modern materials handling equipment, including the latest in lift trucks, pallets, racks and cranes, will speed up operations in the warehouse. The building has a ten-car railroad siding and a loading platform to accommodate 14 trucks.

The new warehouse will house the General Warehouse department, the Philadelphia district warehouse and the central warehouse for wire rope and hardware products.

Lowance Elected to Post With Westinghouse Air Brake

Westinghouse Air Brake Company has announced the election of Dr. Franklin E. Lowance as vice president of research and engineering at its Union Switch & Signal division.

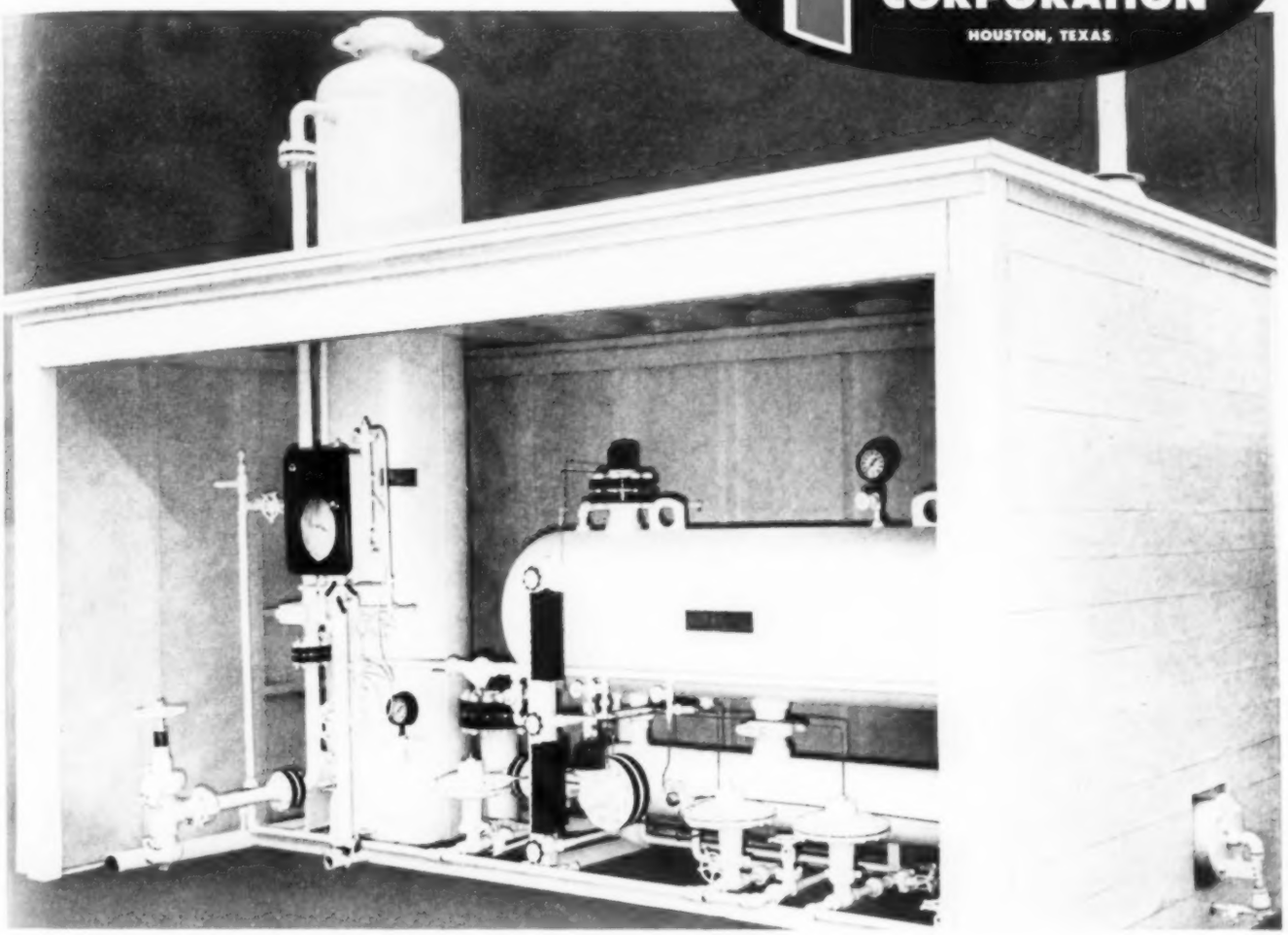
During World War II Lowance was associated with research groups at Massachusetts Institute of Technology and Harvard University, where he worked on military equipment and systems. He later became associated with several Naval laboratories as associate technical director and director respectively, and also served as a consultant to industry.

He joined the Westinghouse Air Brake Company's organization in 1953; first, with its electronic subsidiary, Melpar, Inc., later in the executive headquarters organization at Pittsburgh; and about a year ago,

For more data on advertised products, use Readers' Service Cards, last page.

a revolutionary new development by

fish ENGINEERING CORPORATION
HOUSTON, TEXAS



the new FISH well head gas dehydration unit

Here is a revolutionary new gas dehydration unit that greatly reduces overall dehydration costs. The new Fish Unit uses calcium chloride as the dehydration agent in a tower of patented design that removes from two to three times as much water per unit of desiccant as former methods. No fuel is needed for the dehydration tower. No maintenance is required aside from reloading desiccant and changing charts.

The Fish Dehydration Unit is packaged to include a separator, a heater to keep water in the separator above freezing and necessary controls and instruments. The entire unit is enclosed in a winterized structure.

Extensive field tests have proved the efficiency of the Fish Dehydration Unit even in severe winter climates. For full information, write Fish Engineering Corporation, Manufacturing Division, Aztec, New Mexico.

FFILIATED COMPANIES: FISH ENGINEERING CORPORATION, HOUSTON, TEXAS
ISH SERVICE & MANAGEMENT CORP.; FISH NORTHWEST CONSTRUCTORS, INC.

We challenge you

to find better

PROTECTIVE CLOTHING!

Toughest by Test FROG BRAND®

illustrated above: ¾ length coat

Sawyer

- 100% protection against oils, chemicals, alkalies, abrasion — and other hazards!
- "Exclusive Coating Process" . . . (for years and years of extra wear and durability) — *original* with Sawyer!
- guaranteed not to peel, blister or crack in ordinary usage!
- double interlocked sewn seams that *can't* come apart!
- solid brass or non-conductive fastenings that *can't* rip off or corrode!
- designed for roomy, action-free comfort!

Sawyer clothing also Rubberized or Oiled. Full range of jackets, pants, coats, hats, aprons for *more* efficiency, *more* economy, *more* protection on every job!

Make us prove it!

Send for complete details and price list.

The H. M. Sawyer & Son Company

A Division of Sawyer-Tower, Inc.
specialists in Protective Clothing for more than a century

8 Thorndike St., Cambridge 41, Mass.

with Union Switch & Signal division, where he has been director of research and engineering. As vice president Lowance will continue to be responsible for and direct research and engineering activities at that division.

General Electric Sends Teague To Metallurgical Products

Thomas S. Teague, supervisor of the Malta Flight Propulsion Laboratory of General Electric's Aircraft Gas Turbine division, Evendale, Ohio, has been appointed manager of materials in the manufacturing section of the company's metallurgical Products department, Detroit.

Teague, who was associated formerly with Bethlehem Steel, served in manufacturing and engineering capacities in the company's Chemical, Apparatus and Defense departments. Also he was formerly production manager of Alnico operations in Schenectady, N. Y., before those operations were moved to Edmore, Mich.

Youngstown Sheet and Tube To Build New Office Building

The Youngstown Sheet and Tube Company has announced plans for the building of a modern three-story general office building in Youngstown, Ohio.

The structure will be ready for occupancy late in 1957 and will have a total floor area of 183,000 square feet. The ground floor will feature a large assembly room, dining room, recreation rooms, garage, and storage and maintenance facilities. The first and second floors will be devoted to offices.

Fisher Names J. M. Smither Georgia Sales Representative

Fisher Governor Company, Marshalltown, Iowa, has named Jack M. Smither & Company sales representative for Georgia, Florida and eastern Tennessee.

Jack M. Smither

Smither joined the Fisher sales organization in 1945. Since then he has been associated with the offices in Tulsa and Dallas. Howard Wheeler and David P. Thomas will be associated with Smither in this office at Atlanta, Ga.

Fischer & Porter Appoints Russell, Abbey to Sales Posts

Fischer & Porter Co. announces the appointment of two regional managers for data reduction and automation equipment. These are new positions created to handle the sales of automatic data handling systems.

Harold L. Russell becomes eastern regional manager, with headquarters in Hatboro, Penn. For the past seven years, Russell was employed as a sales engineer by Minneapolis-Honeywell. William C. Abbey becomes southwest regional manager with headquarters in Houston. Abbey's previous associations were with Manning, Maxwell, and Moore as sales engineer, and with Socony-Mobil as process engineer.

Matullo Named Branch Manager For Worthington Corporation

J. R. Matullo has been appointed branch manager of the Worthington New Jersey sales office. Matullo joined Worthington in 1934 as an application engineer in the Harrison division centrifugal Pump Sales department. In 1936 he transferred to the corporation's New York district office, serving until 1938 when he returned to Harrison to the New Jersey sales office as a general line salesman.

J. R. Matullo

See Composite and Refinery Catalogs, or Write for Specifications Folder

FLEET®LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from ¼" to 24"

ASTM A234

Also for pressure vessel heads

Special sizes and lengths. Schedules 10 to 160 Stainless Steel, and other Alloys.

Nominal pipe sizes 1" to 30"

ASA B16.9
ASTM A234

Immediate Delivery

STEEL FORGINGS, Inc.

P. O. Box 276K • Shreveport, La.

Foot of Fannin Street

NEW! Write for Bulletin.

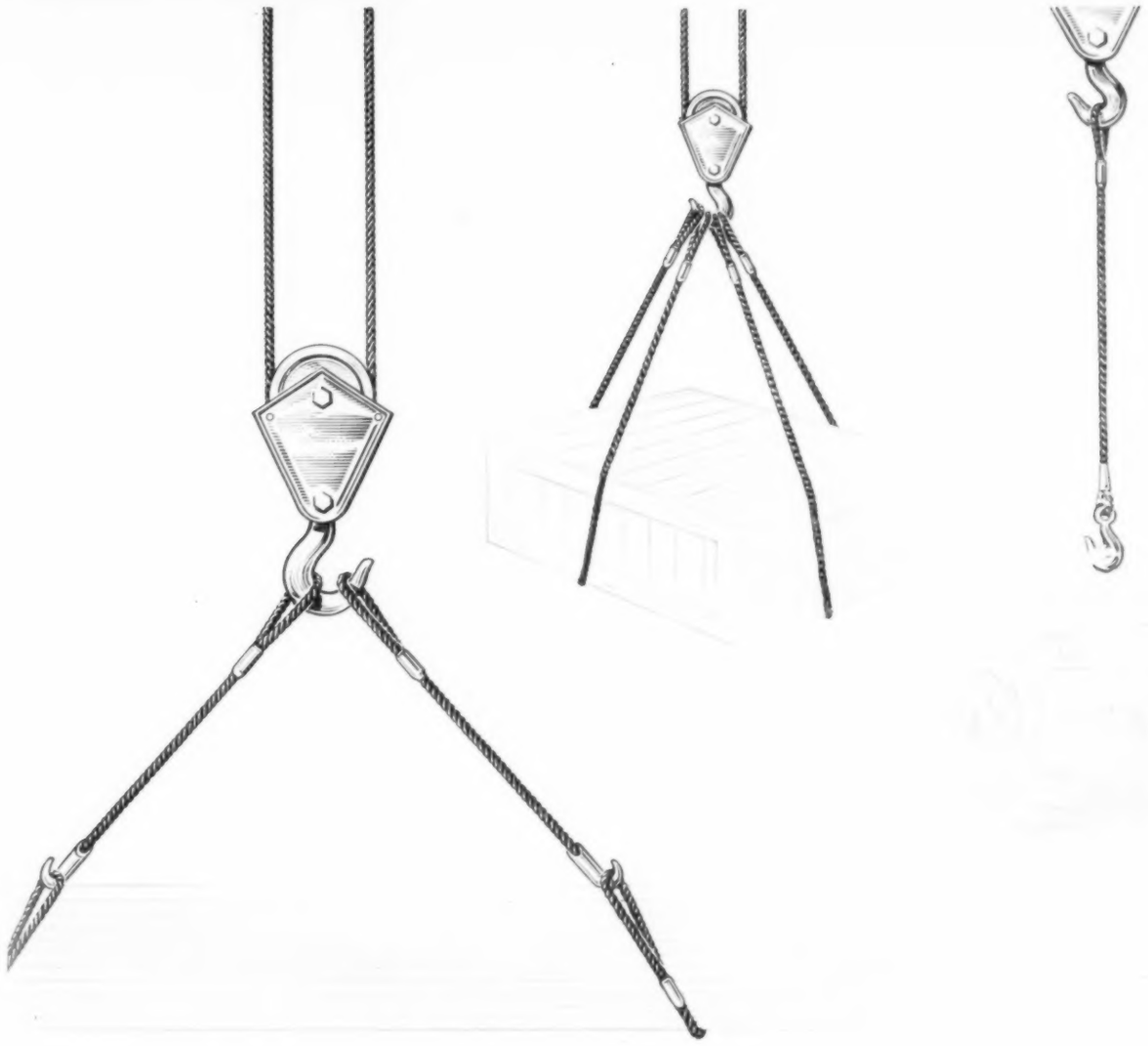
Patented

PIPELINE VENTS AND MARKERS

FLEET-LINE CO.

P. O. BOX 276K

SHREVEPORT, LOUISIANA



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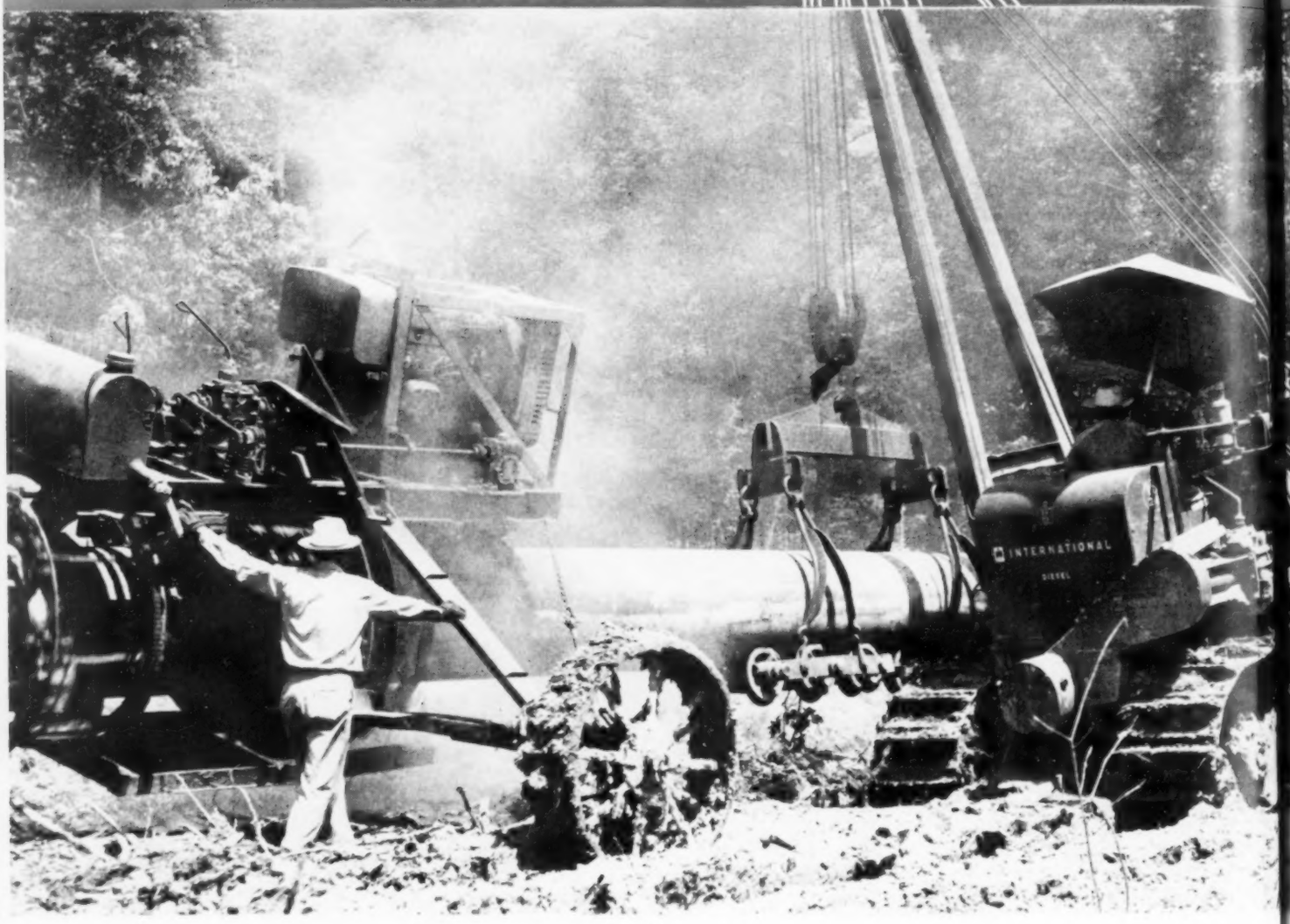
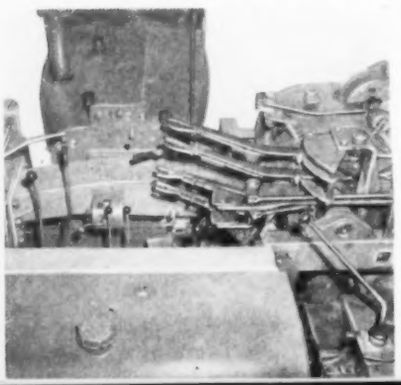
International® Superior TD-24p

give you these terrain-beating, job-speeding a

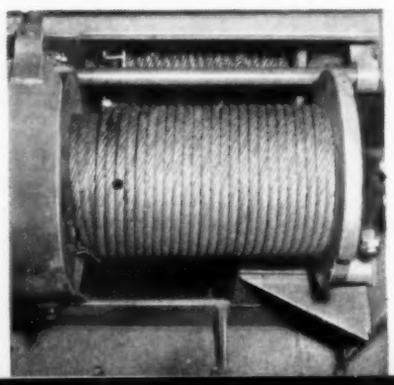


EXCLUSIVE:



You get super-fast control with minimum operator effort — with International Superior Pipeboom reach-easy control lever clusters. Load line is fully enclosed in heavy box-section for maximum safety to operator. The rugged boxed cable guard also serves as a rigid frame cross-tie.

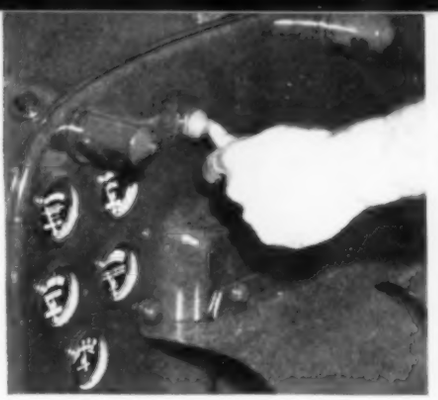
EXCLUSIVE:



You get wear-saving cable alignment — with individual drum shaft mounting to position the cable. This exclusive design increases sheave life, as well as providing straight line center-to-center cable pull from boom and load sheave to drum.

24 pipebooms

ing advantages



EXCLUSIVE:

You get time-saving, capacity-adding maneuverability and load control that no other boom unit delivers—uphill or down! Exclusive International TD-24 Planet-Power steering is the reason. You "feed" full-time live power to both tracks to insure *positive* steering and *positive* traction. Exclusive finger-tip hydraulic braking and foot decelerator add to positive load control.

EXCLUSIVE:

You get hour-saving, seconds-fast all-weather International gasoline conversion diesel starting — that conditions the TD-24's engine seconds-fast for full-diesel, full-capacity operation. Get up to 15% *bonus pipe-laying time daily* in cool weather, especially, with this fast, genuine, in-seat push-button starting!

EXCLUSIVE:

You get a big mud-beating margin of flotation—because TD-24 boom units put 14% to 18% less poundage psi on the tracks than other makes. With this extra *flotation-traction*, TD-24 Superior pipebooms keep handling big loads on boggy ground, without tipping or miring!

EXCLUSIVE:

You get exclusive choice of direct gear drive TD-24 (190 hp) or torque converter model (200 hp). Also, you have a choice of a top hinge counterweight model (90,000 lb. lift) or a bottom hinge counterweight model (110,000 lb. lift).

On any cross-country pipe-lining spread you put together, these big International TD-24 Superior pipeboom exclusive advantages can tremendously affect your job profit sheet! Compare how new bonus-powered International Superior TD-18, TD-14, and TD-9 pipebooms outperform any other units in their size classes. Why be satisfied with anything less than International Superior performance? See your distributor for a demonstration of the International Superior boom and tow equipment your spread needs!

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It will instantly locate all subsurface pipes, cables and such, and determine their depth too. The etched circuitry, our latest innovation, assures better quality control and performance than the customary hand wiring method. You can avoid damaged structures and loss of time with the Wilkinson Line Locator.

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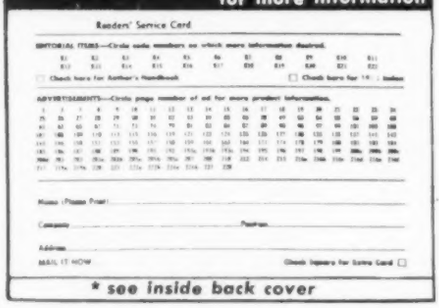

* see inside back cover

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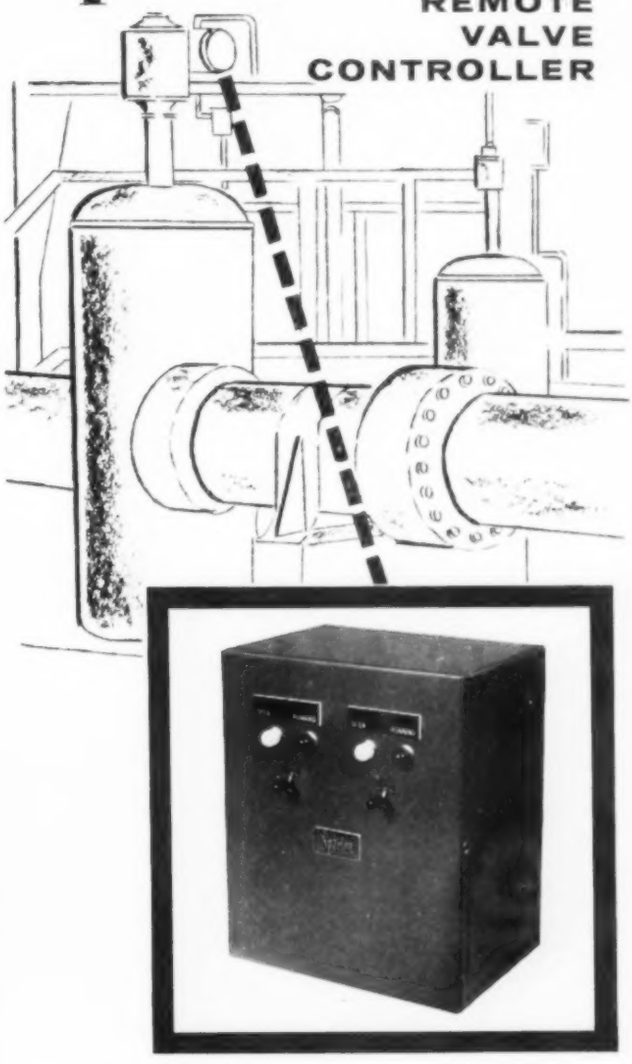
REMOTE VALVE CONTROLLER



For Finger-tip Control Over Many Miles

Utilizes either a two conductor or single conductor and ground interconnection for long distance control. Employs DC impulses for remote open-close or proportional control of practically any valve.

Basic system provides valve status lamps on master control unit. Plug-in modules are easily added to provide additional supervisory lamps such as power failure; disagreement, control line failure.

Proven by use in many major pipe lines.

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**Say hundreds of pipeline workers using the Alston Ratchet Pipe Cutter.*

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The Alston Pipe Cutter completely eliminates sparks . . . no line explosions. No more time consuming pipe bleeding.

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This tool cuts 10-inch pipe in less than 15 minutes. Roller guides eliminate broken cutters. The ratchet makes working in close places easy.

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Begin to use this precision made cutter in your pipeline operation for safer, quicker, economical pipe cutting. Write for literature and prices.

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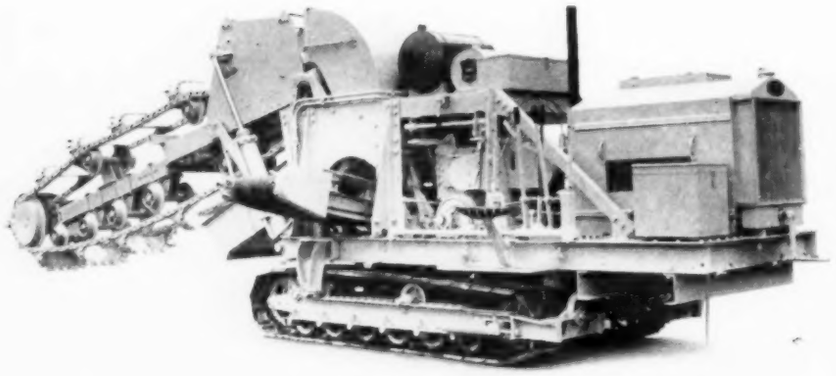
What's New in Equipment

for the Pipe Line Industry



Trench Excavator

John Allen & Sons (Oxford) Limited has introduced a new trench excavator, the Allen 14/30, which incorporates the best features of the Models 16/60 and 12/21. The 14/30 can dig a range of trenches from 14 inches to 30 inches wide, to a maximum depth of 8 feet 6 inches, the low center of gravity of the machine ensuring great stability at all times.

The sawing action of the bucket line means minimum vibration, no tearing of the ground, and clean cut trench walls which are not so likely to collapse. In soils inclined to be wet, its speed allows dry digging before percolation of water has its full hindering effects.

Among the special features of this model are the reverse gear in slow traction which allows the machine to cut in reverse to undercut underground cross services and the three point suspension which gives balance to the machine on slight ground irregularities. An arc type conveyor with troughing rollers for the quick discharge of excavated material and a telescopic digging boom which can be lengthened or shortened to suit the depth of the trench required are incorporated in the new trench excavator.

There is a choice of two British oil engines—the Gardner 4LW or Dorman 4LB, both developing 50 brake horsepower at 1200 revolutions per minute. Special tropical radiators can be supplied.

For more data circle **No. E1** on Readers' Service Card, last page this issue.

Wedge Lock Pipe Plug

T. D. Williamson, Inc. is manufacturing a new device that can be inserted and securely locked into the open end of a pipe line or piping to withstand high pressures.

This plugging device, known as the Wedge-Lock pipe plug, is used to pressure-up piping and vessels for hydrostatic or air testing and to propel pigs by compressed air. It is also used to plug open pipe ends to permit welding without hazard of flammable vapors.

For more data circle **No. E2** on Readers' Service Card, last page this issue.

Dump Trailer

Lufkin Trailers, a division of Lufkin Foundry and Machine Company, has introduced a new hydraulic dump trailer which is designed to take years of miles on rugged terrain. The dump is hoisted by a hydraulic hoist which maintains a constant pressure, guaranteeing an evenly lifted load.

The Lufkin hydraulic unit folds into the body of the trailer allowing the trailer to ride on a conventional fifth wheel. The single hydraulic hoist is located directly over the truck axle, giving it a sturdy base and allowing a much heavier load to be carried.

The Lufkin hydraulic dump also is noted for its load dumping features which eliminate the need for a truck winch. Lufkin's dump is a light weight frameless model and has many safety factors incorporated in the design. Should the trailer be overloaded, the hydraulic lift will not operate beyond a certian point. Nothing breaks or falls. Contrarily, in such instances with winch or cable type trailers, the load will fall if a cable breaks, resulting in possible serious injury to operating personnel or costly damage to the trailer and tractor.

By applying truck brakes and raising the dump bed or by applying trailer brakes and lowering the dump bed, a driver can work out of soft spots and mud holes as quickly as if he were driving a four wheel drive jeep.

Lufkin has this trailer in both single and tandem axles. Capacities range from 10 to 24 cubic yards and in lengths to permit maximum payloads under existing "bridge formula" laws. The customer may make his selection from five different hoists.

For more data circle **No. E3** on Readers' Service Card, last page this issue.

Good People to Know
-Gaso Distributors*
They have the knowledge it takes to make sound recommendations. They're service-minded, with stocks that assure quick delivery of pumps and parts. Competent and cooperative, they're another reason why GASO Pumps are first in their field.
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SERIES 3600—for water-flooding, salt water disposal, oil well acidizing, oil well fracturing, crude oil gathering systems. Pressure range: Fig. 3671, 1575 to 800 PSI; Fig. 3670, 6250 to 1935 PSI.

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GET GASO DEPENDABILITY IN WATER FLOODING, TOO

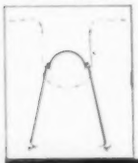
Here's the Fast Easy Way to Anchor Pipelines

No heavy equipment to haul. Cuts costs to a fraction.

Chance Pipe Line Screw Anchors and Brackets greatly simplify pipe line anchoring, compared to other methods, and save many dollars in pipe line construction.

Chance Pipe Line Screw Anchors can be installed in pipe line ditches without extra digging. Using a power wrench the operator merely guides the anchor in place. The tool does the work.

Can be installed in the ditch without extra digging.



Write for catalog showing oil industry applications of Chance Earth Anchors.

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TORONTO, ONTARIO, CANADA

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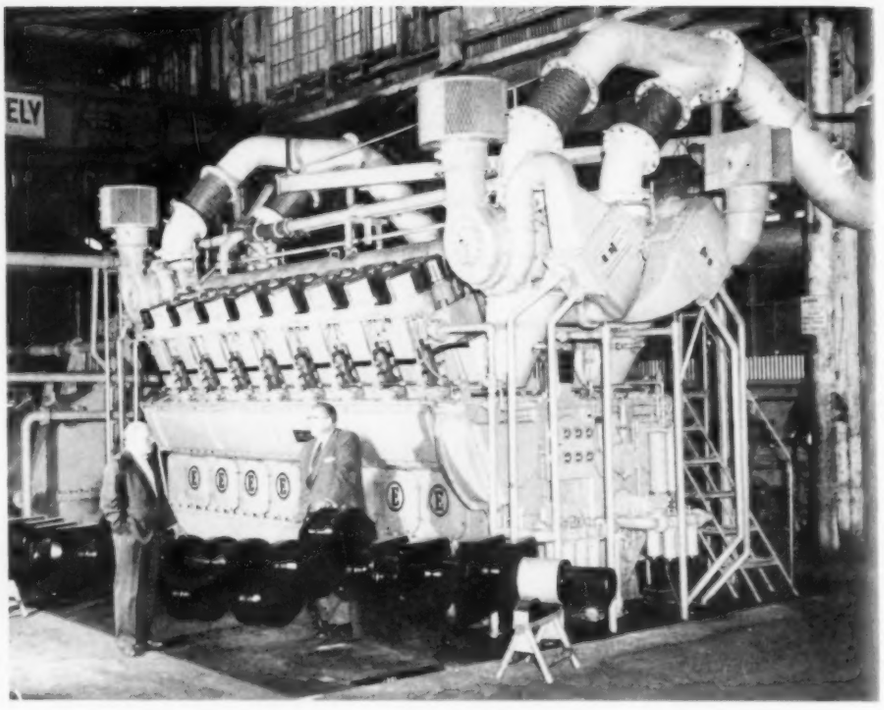


Diesel Engines

The RV-16, prototype of a new line of industrial diesel engines, has been completed by Enterprise Engine & Machinery Co. Sold to the government of Saudi Arabia, the new engine is completing dynamometer tests to verify its rating of 7700 horsepower at 400 revolutions per minute.

The company's first V-type engine, the RV-16 is more than 20% shorter and 30% lighter in weight. RV engines will be built in 12 and 16-cylinder models. They will provide power for electric generation in municipal or industrial plant applications and power for oil or water pumping stations.

For interchangeability and to maximize savings in length, the RV design incorporates cylinder specifications from the Enterprise R-series engines, 17 by 21-inch bore and stroke. The R-series cylinder center distance of 24 inches dictated the connecting rod construction in order to keep bearing and bushing loads to conservative values.

Normally aspirated or tubocharged, the RV can be furnished to operate on diesel or heavy fuel, as a dual fuel engine, as a spark-ignited gas engine, or as a tri-fuel plant.

For each pair of pistons in the RV-16, there is only one rod connected in conventional manner to the crankshaft. The other rod is a short "slave" linked to the "master" rod. This arrangement means only eight connecting rod bearings and permits greater crankshaft bearing area for the thrust from each piston. Areas are additionally increased by a re-entrant fillet design in the crankshaft. Together with other design aspects, the bearing construction gives the RV-16 a calculated load carrying capacity 2.8 times that of the Enterprise R-series diesels.

For more data circle **No. E4** on Readers' Service Card, last page this issue.

Excavator-Crane

A new model excavator-crane called the "Pipeliner" is being manufactured by the Insley Manufacturing Corporation. The carbody is of wide design equipped with removable bottom cover plates. Crawler rollers and tumblers are sealed against dirt. Crawler shoes and pins are of heat-treated alloy steel.

Backhoe attachment features the Insley differential drum and wide foot boom. Side cutters are standard equipment for the hoe bucket.

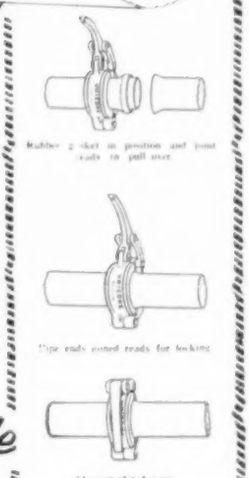
The "Pipeliner" is available with 24-inch or 30-inch shoes and 12-foot, 6-inch long crawlers. Travel speed with single speed transmission is [illegible] mile per hour with optional two-spee

INSTANTANEOUS! JOINTS

A perfect seal in a matter of seconds

For temporary pipe lines 'Unicone' instantaneous joints are recommended. Comprising two parts only, they fasten with a "snap" ensuring a perfect seal in a matter of seconds.

For permanent or semi-permanent pipe lines 'Unicone' bolted type joints are usually employed and can be assembled far more quickly than any flexible joint giving positive anchorage.



Rubber gasket in position and joint ready to pull over

Pipe ends pulled ready for locking

The completed joint

'UNICONE' REGD

Flexible Joints for all Pipelines.

Leakproof. safe. reliable

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SIMPLEST WAY TO
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AND SALVAGE
NEW AND USED
WELDING FITTINGS

The "Universal" FLAME CUTTER connects to your regular source of gas and power . . . is completely self-contained. Cuts all types of fittings . . . elbows, tees, returns, reducers, swedges, caps, pipe and flanges. No limitations such as found in hand operated and other types of machines. Cutting speed is easily controlled by a variable speed transmission. Unit incorporates VERNON unitized cam actuated gas control valve for quick, easy cutting adjustment. SAVES TIME, MONEY AND FITTINGS. Write for Bulletin FC-8.

- Cuts ells to any angle.
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- Miters welding neck flanges.
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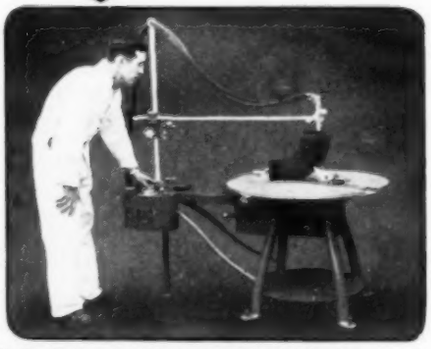
- Cuts coupons.
- Makes swedges out of welding caps.
- Recuts and bevels used ells, tees, swedges, returns.
- Cuts and bevels short pieces of pipe to 36" diameter.



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FLAME CUTTER
VERNON TOOL CO., LTD.
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A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol.

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● No matter how specialized the liquid level control application, adapting Magnetrol to meet it presents no problem. Whether it's for high pressures, high temperatures, corrosive liquids or any other condition, a few "standard" modifications and the job is done! Operation is so simple no changes in basic design are needed. That's why Magnetrol "fits" practically any application — why "specials" are so often standard with us.

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Magnetrols are available for controlling level changes from .0025-in. to 150-ft., with single or multi-stage switching. Our experienced engineering staff is at your service.

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Please send me catalog data and full information on Magnetrol Liquid Level Controls.
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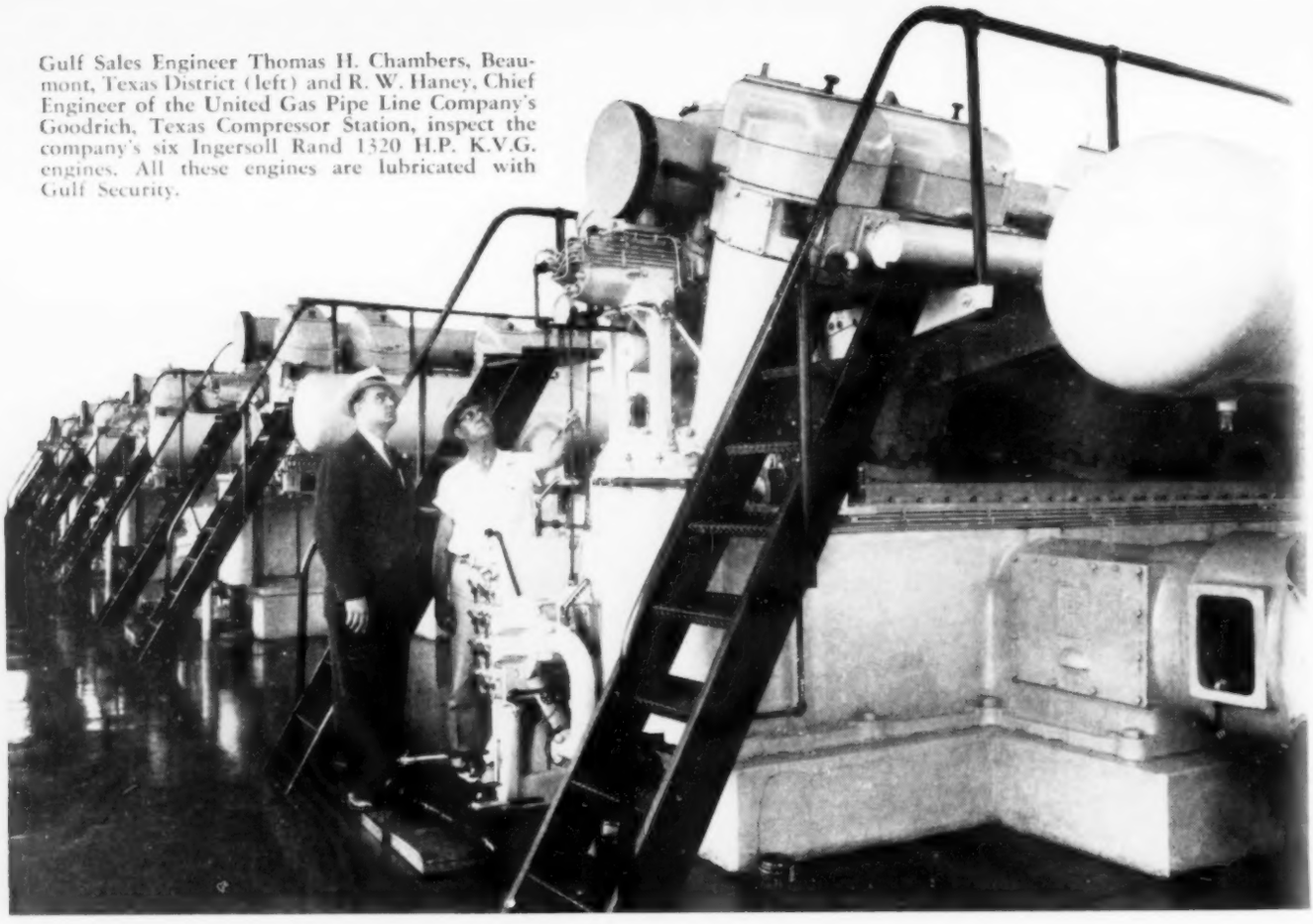
City_____ Zone_____ State_____



Gulf Sales Engineer Thomas H. Chambers, Beaumont, Texas District (left) and R. W. Haney, Chief Engineer of the United Gas Pipe Line Company's Goodrich, Texas Compressor Station, inspect the company's six Ingersoll Rand 1320 H.P. K.V.G. engines. All these engines are lubricated with Gulf Security.

Lock out high maintenance costs in your gas transmission plants

with GULF SECURITY

Gulf Security's outstanding record in the lubrication of pipeline gas engine compressor units is your assurance of smooth, continuous operation. In scores of gas transmission plants this high quality straight mineral oil helps prevent operating troubles and contributes to low maintenance costs.

Gulf Security is a non-additive oil that does not cloud liquid filled lubricators of power cylinders, compressor cylinders, and packing glands. After years of operation with Gulf Security, cylinders and piston rings of both compressors and power assemblies show negligible wear, and its excellent oxidation stability helps prevent the formation of acid and resins in the crankcase system.

Make certain your units receive safe, effective lubrication protection—specify Gulf Security. And remember that Gulf provides the services of a trained, experienced petroleum expert—the Gulf Sales Engineer—to help you with any problem involving a petroleum product. Consult the telephone directory for the number of your nearest Gulf office.

GULF

Gulf Oil Corporation • Gulf Refining Company
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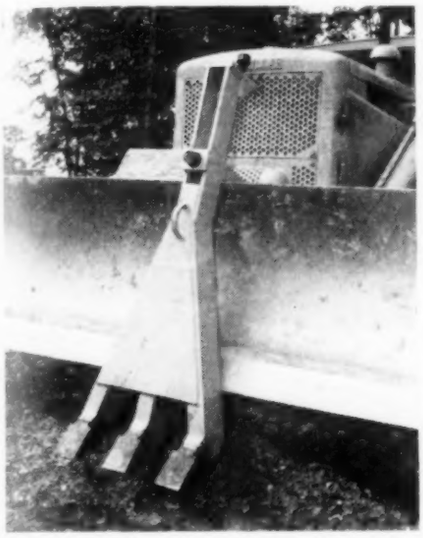
THE FINEST PETROLEUM PRODUCTS FOR ALL YOUR NEEDS

nsmission. Total weight as a backhoe is 380 pounds.

Optional equipment offered includes o-speed transmission, tractor type crawl-, brake-type cab lock and independent om hoist. This excavator-crane can be uipped with the full range of front end achments and is available with gasoline diesel engine.

r more data circle **No. E5** on Readers' rvice Card, last page this issue.



Stumper

A new stumper, the Ransome Model R100, has been introduced by The Ransome Corporation. The new three-prong stumper can be attached to any bulldozer blade from 35 inches to 51 inches in height. The Model R100 features a positive clamping device which permits its being mounted or dismounted in a matter of minutes, freeing the bulldozer for gathering stumps. No alterations to the bulldozer blade are required. The stumper has replaceable manganese teeth.

This model permits the concentration of the power of the tractor and the lifting force of the bulldozer blade at the base of the stump, resulting in quick removal of the stump with a minimum effort. Soil around the stump need not be disturbed.

For more data circle **No. E6** on Readers' Service Card, last page this issue.

Nozzle

A new fire fighting nozzle has been introduced by National Foam System, Inc. The PW-50 nozzle can be shifted quickly straight stream or spray stream operation, using either foam solution or water lone.

It will extinguish fires on the ground, sludge or settling pits, in ponds and in rge dike areas. It may be mounted on am trucks, fire boats or crash trucks. may be used with fixed piping near rocess units in refineries and chemical lants.

Depending upon the operating pressure, lumes of up to 4600 gallons per minte of foam can be obtained. Range of aight foam stream extends to 200 feet, hile spray stream operation produces a am spray pattern as long as 88 feet. The ozzle weighs only 54 pounds, is 40 inches over-all length and is equipped with 2½-inch connection for hose or pipe.

r more data circle **No. E7** on Readers' rvice Card, last page this issue.

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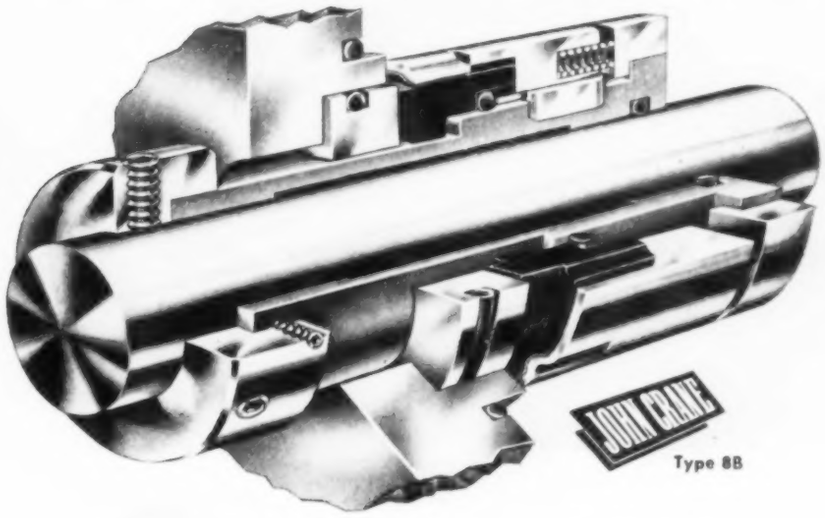


These Important Facts Tell Why

Reports from the field reveal that after 2½ years of continuous operation "John Crane" Type 8B Seals are still in perfect operating condition. This adds up to over 20,000 hours without shutdown!

Man-hours are being saved. The 8B is quickly installed and adjusted simply by sliding the entire unit along the shaft into position. The top casing need not be removed.

High pressure problems are eliminated. "John Crane's" exclusive hydraulically balanced construction permits handling of pressures up to 1200 psi.

The 8B comes in a full range of sizes to meet individual specifications and can be engineered to practically any on-the-job requirement.

***Be sure you get "John Crane" 8B Seal performance.* Contact Crane Packing Co., 6434 Oakton Street, Morton Grove, Illinois (Chicago Suburb).**

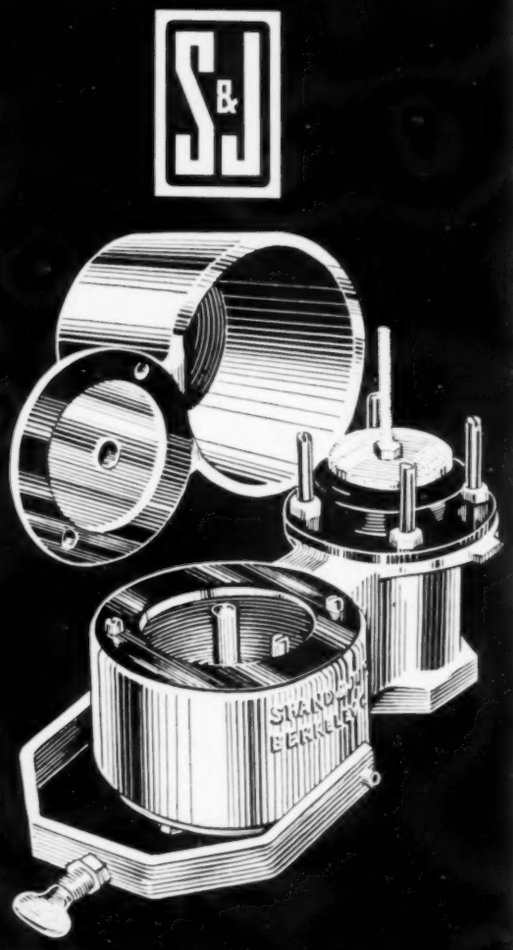
In Canada: Crane Packing Co., Ltd., Hamilton, Ont.

CRANE PACKING COMPANY

Instant Accessibility

THE Shand & Jurs breather valve for bulk plant storage tanks provides maximum accessibility to working parts for inspection and cleaning. The vacuum and pressure covers are cast in one unit, and this single cover is held in place on the S&J breather valve by one thumb screw mounted on a swinging yoke. Just a few turns of the thumb screw and the cover is instantly removed, exposing both valves to view.

This S&J breather valve, designated Fig. ST-3695R, is available in 2", 3" and 4" sizes, and has been carefully engineered to give the greatest possible flow capacity. The corrosive resistant construction of the breather valve utilizes valve pallets and pallet seats of thermo-setting molded phenolic. This construction provides greater resistance to shock and corrosion damage, and will assure increased dependability even under the most severe operating conditions. Contact the factory or nearest branch listed below for additional information on the S&J breather valves for bulk storage tanks.



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M & M Bldg.

TULSA
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CHICAGO
10409 S. Western Ave.

LOS ANGELES
6399 Wilshire Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St., W.
TORONTO: Lytle Engineering Specialties, Ltd., 69 Eglinton East
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CALGARY: P. D. McLaren & Son, Ltd., 510 - 9th Ave. W.
MEXICO, D.F.: Dalma Comercial, S. A.
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader's Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card. Requests are transmitted to the manufacturer as soon as received by us for mailing of desired information directly to you.

Crawler Tractors

Mechanical features of the new International diesel crawler tractors are described in a new folder published by International Harvester Company. Described are the International TD-24, TD-18, TD-14, TD-9 and TD-6 models, with photographs of the machines on the job and close-ups of such features as the new Cermetallic clutch facings, improved operator visibility, pressurized cooling system, etc.

To get a copy circle **No. E8** on Readers' Service Card, last page this issue.

Diesel Engines

Alco Products Inc. has announced publication of a 14-page bulletin on the company's new "family" of diesel engines—the 251 series—available in ratings from 550 to 2400 horsepower.

The engine series includes the six-cylinder in-line model and the 12 and 16-cylinder Vee-type engines. Cutaway views of the engine are shown in the bulletin as well as dimension charts and specification tables.

To get a copy circle **No. E9** on Readers' Service Card, last page this issue.

Valves and Pumps

A new catalog featuring diaphragm valves and metering and proportioning pumps has been released by Hills-McCanna Company. Included are specifications on diaphragm valves, tables of capacities on metering and proportioning pumps and complete information including a schematic diaphragm of the new Hills-McCannameter, precision pump.

To get a copy circle **No. E10** on Readers' Service Card, last page this issue.

Fire Standards

Four revised or amended standards regulating the storage, handling and use of liquefied petroleum gas have been published by the National Fire Protection Association. They include bulletins on standards for storage and handling of LPG in utility gas plants, liquefied petroleum gas piping and appliance installations in buildings, and installation and operation of gas systems for welding and cutting.

To get a copy circle **No. E11** on Readers' Service Card, last page this issue.

Magnetic Instruments

Theory and circuitry underlying substitution of magnetic devices for vacuum tubes in industrial high speed counting equipment is explained in the new data file 109 published by Berkeley division of Beckman Instruments.

The bulletin explains how a miniature saturable reactor device (christened "Ferristor" by Berkeley) replaces most of the short-lived vacuum tubes to produce a far more rugged and reliable events-per-unit-time instrument for countless industrial uses. This "Ferristor" reactor functions as both a bi-stable ferroresonant element and a magnetic amplifier with fairly linear transfer characteristics between cutoff and saturation points.

To get a copy circle **No. E12** on Readers' Service Card, last page this issue.

Compressor Troubles

A new book to help locate and correct common air-cooled and water-cooled compressor troubles has been released by Worthington Corporation. A cartoon sequence pictures a full description of compressor troubles, from failure to deliver air to excessive oil consumption.

To get a copy circle **No. E13** on Readers' Service Card, last page this issue.

High Pressure Probe Set

Engineers Tool Company has issued a bulletin on the M-pact-O high pressure probe set to be used with explosion test meter. The M-pact-O is described as the safe way to probe for gas leaks. This gas leak probe set can be used for high pressure or low pressure lines. The short probe penetrates 36 inches, then the long probe takes over and goes down 72 inches.

To get a copy circle **No. E14** on Readers' Service Card, last page this issue.

Magnetic and Motorized Valves

The Mercoid Corporation has published a new catalog illustrating and listing specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants.

To get a copy circle **No. E15** on Readers' Service Card, last page this issue.

Circle numbers on Readers' Service Cards on last page

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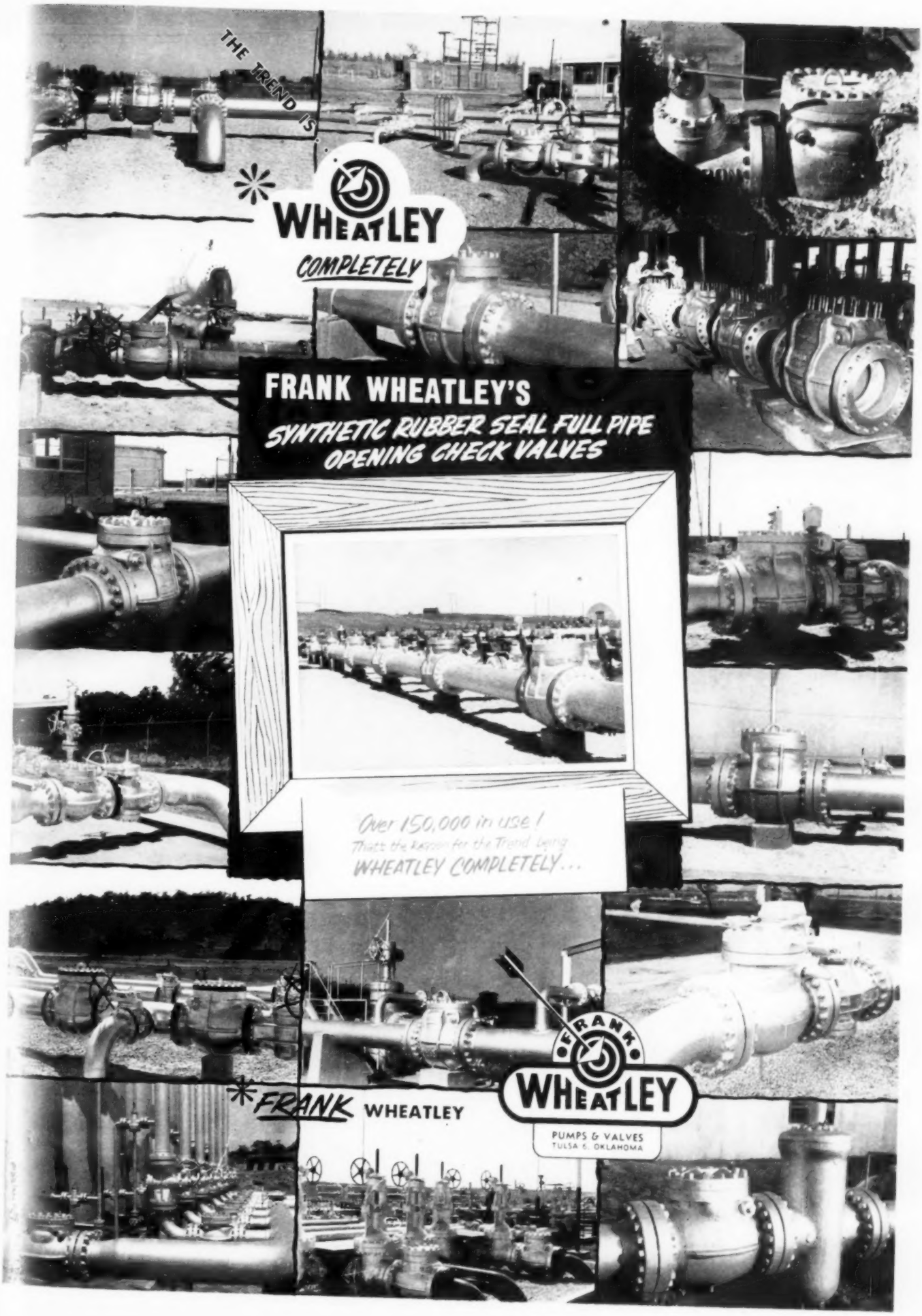
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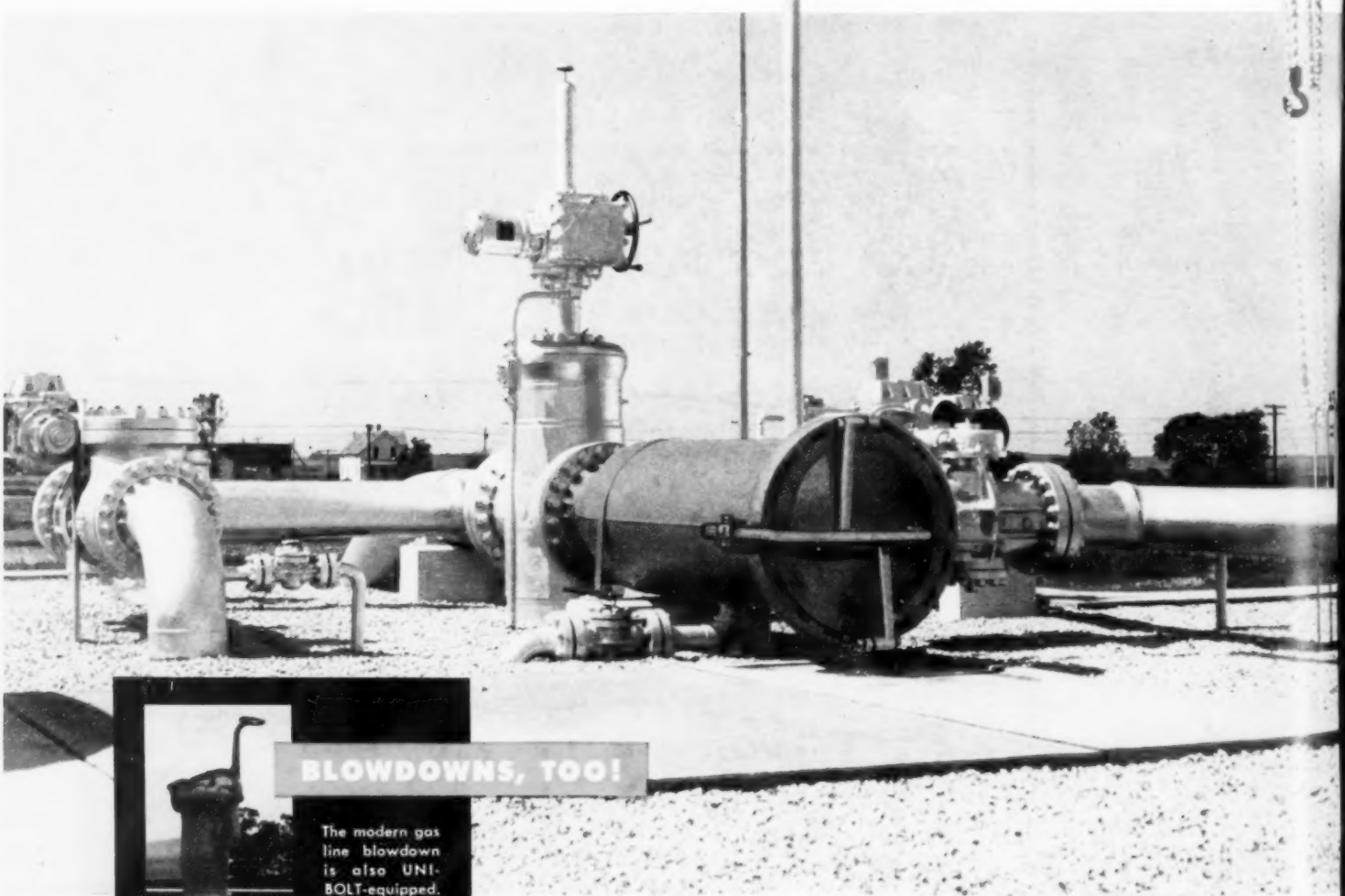

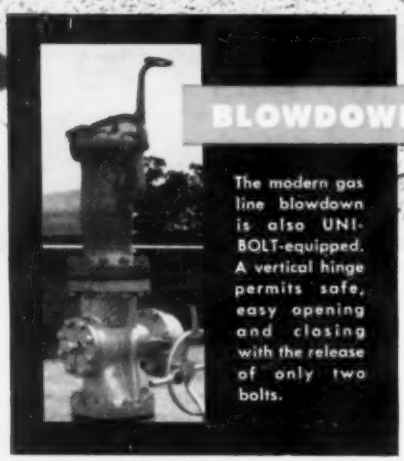

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The modern gas line blowdown is also UNIBOLT-equipped. A vertical hinge permits safe, easy opening and closing with the release of only two bolts.

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